The Builder.

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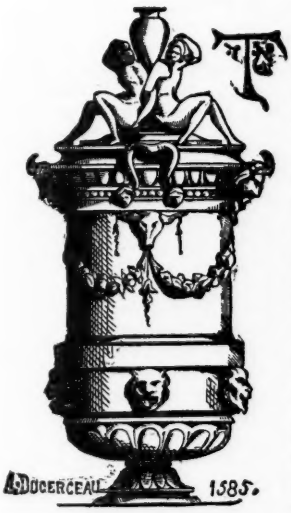
The Primary Elements of Use and Construction in Architecture.



THE requirements of Use prescribe the nature, and in a general way even some limitations, of relative dimension and mass, of apartments, passages, openings, members, and so forth.

The conditions of Construction, again, have their word to say even in these approximate determinations; and again prescribe, recommend, or enforce, in a general way, the nature and some larger limitations in respect to arrangement and magnitude, of the parts of the structure and their members.

But it is the supreme requirement and obligation of Beauty,—"the strong necessity of loving,"—that ordains the last decisions of precise measurement for all. There is no admittance here to be allowed for "there or thereabouts;" and if some lines are drawn at last by free estimate,—adjustments of not trifling import made by "scowl of brow,"—then only is it with justifying success, when artistic aptitude has attained to "something like prophetic vein," and acting by impulses harmonised within, can work in accordance with numerical law when not by law,—can take sure flights even beyond boundaries where curvatures, for instance, become while still regular, regular too subtly for mathematics to lead forward to, or it may be to be competent to follow. When Beauty comes into question, decision rests, in Homeric phrase,—strange that it should be Homeric,—on a razor's edge. The too much and too little that range at large without interference within wide limits of Use and Construction, are here confronted without escape, on either side of a mathematical line. The engineer may systematically proceed by working out carefully first the theoretic strength required for his beam, and then doubling the result in execution with content and security; but the difference of an inch in the profile of a column or capital could scarcely be more destructive of expression if made in the profile of a beautiful face.

Beauty, then, working by proportion, develops the suggestions of Use and of Construction into elegance and ornament,—deals freely and inventively with these suggestions in originating kinds, styles, of enrichment and decoration,—and at last decides the precise contact and impact of mind and matter, the quantities, the degrees and proportions, for actual execution in distributed forms, and even light and shade and colour.

So Proportion holds sway throughout the entire realm of architecture, in variously modified application. Relative, proportionate, sizes and loftinesses have to be considered in combining stories, distributing offices, adjusting communications and openings. It is no less authoritative in decisions as to the responsibilities of bearings and supports or the appropriation of materials; but the injunctions so imposed are at last but lax,—are elastic in at least one direction, and there to almost any extent. Provided one requirement in one direction has been answered, any proportion whatever out of multitudes, and these with no special relation to each other, may be competent to secure it, and so far be equally admissible. Only when Beauty is to be realised does Proportion become exactingly precise and exclusive in its indications, and only through proportion so applied is Beauty to be realised.

To enable us to study and define the principles of these ultimate applications, it will be desirable to review, however generally, the antecedent conditions of Use and Construction, and to attempt a certain classification of their developments.

The conditions of more pure usefulness in a building have reference either to Exterior or Interior circumstances; and in each case the circumstances to be considered may be classed as those dependent on human will and action, or such as originate in the independent forces of nature. Every structure that we need take account of is, more or less, a fortification against external foes that are capable of attacking either the inmates or the building itself. Wilful and Climatic damage have alike to be reckoned with and resisted. These necessities postulate a definite continuity below, around, and above, a certain solidity and compactness, effective security of openings, limitation of accessibility. The requirement for the protection of the building itself on the exterior against climatic influences, has ever made characteristic impress on details and even larger elements, of architectural style. The tendency to settlement, or unequal settlement, through the omnipresent power of gravitation, is a constant consideration, of course, to which are added incidentally the possibilities of fire, of lightning, or of flood in storms, and constant exposure to vicissitudes of temperature,—warping heat and disruptive frost,—to impact of furious winds and downfall or driving of rain, hail, and snow.

Every building thus requires to be armed and armoured against wilful damage and disintegrating influences; and differences of climate should, therefore, naturally induce as great differences in external architecture as the differences of social development that in successive ages modify liability to hostile attack.

This is, no doubt, to a great extent, the case; and the very physiognomies, so to speak, of Greek and Egyptian buildings severally display, as accurately as could be wished, the anticipation of heavy storms of rain in one case, and the contrasted unconsciousness of any such liability at all in the other.

The master-hand—the master-mind—is recognised when such modifying proprieties are responded to with prompt sensitiveness, and are made motives of new developments. But we shall err egregiously if we assume that this was ever invariably so in the development of historic art. It is not here that we can rely on possessing a key to every successive problem. All other forms of incompetence apart, that will have their royalties in every age, subjection to tradition, whether at first hand or at second, hampers many an even daring soul; and original genius is not only subject to original blunders, but can scarcely escape all hereditary sin; and it is well if the tenacity of prejudice only keeps down a single lagging wheel in the old obstructive rut. The cult of genius is, at any rate, only disgraced by admission of a factitious saint-worship; and till we can bring ourselves to hold the noblest predecessors strictly to account for error or shortcoming, we shall hardly have the brave heart to bring to bear a duly sharpened scrutiny inexorably upon our own. This stringency of criticism will but enhance our admiration when the retention from earlier time of characteristics no longer essential, is so managed that the interest of the historic link is valuable, while yet art and its proprieties are unimpaired.

As regards the conditions of usefulness of a building towards the Interior, it is only necessary here, for the sake of formal completeness of classification, to distinguish,—

1. The scheming and distribution of apartments, sets of apartments, and communications, for haunt and transit, occupation and intercourse.

2. The arrangement and management of openings generally for ingress and egress, outlook and prospect, entrance and circulation of light and air and warmth.

All stages of civilisation, all varieties of national habits and of social position, originate special combinations of these, to meet more or less successfully—we must prepared to admit, very often unsuccessfully,—the special needs.

A complementary history of architecture should render an account, in series and in detail, of these solutions, or approximate solutions, of the architectural problems presented in successive ages and different nations. The history of architecture is not exhausted by the very best histories of design in façades or in plans exclusively, of structures that, while of the highest dignity, are still most simple in general distribution. The domestic dwellings of several grades of society of all nations, at any time, at the present time as well as any other, might be the subject of a work that, with full elucidations, would be of highest interest. The statement of the problem that the architect was in each case called on to solve,—such as Wootton gives, but still in too brief and general terms, for the Italian palaces of his time,—would be one of the very best illustrations of national manners; while keen and conscientious criticism of the value and perfectness of the solutions, would give a concurrent chapter in the history of Art. Much as the interest in the revolutions of Florence, as we follow them in the manly pages of the "History of its Commonwealth," by A. T. Trollope, is enhanced by familiarity with the aspect of all its streets and structures, it is impossible not to feel that the last illustration is wanting till we know every inner chamber and gallery and closet of the Riccardi and Strozzi Palaces.

The conditions of Construction have also to be reviewed, no less than those of Use and Occupation, and for our purpose scarcely require to be classified more broadly,—characterised less summarily.

Construction is a word that implies combination of detached materials, but, for the sake of theoretical exhaustiveness, must be extended to cover a case apparently so contrasted as excavation. A grand temple, no less than a stately apartment, may be hollowed and carved out of the living rock,—and has been. Such a structure, so to call it, is, after all, in the same category, as compared with a Cyclopean gallery, as a like apartment composed of a mass of artificial but continuous concrete. The seemingly important distinction between the rock and the concrete, that one was always as it remains a single piece, and the other only became so as it grew under the hands of artificers out of fragments innumerable, is scarcely essential, when the result is identical at last, and for all time. The difference, so viewed, is but insignificant, between a monolithic granite column in original entirety and the same re-erected after division into frusta, that shall be reunited with cement equivalent in strength to the original stone. Neither, then, can we, from this point of view, admit a difference between a wall with cement at least as strong as its bricks and stones, and a wall of homogeneous concrete, wherein the stones are only smaller and self-bedded casually, and this whether the proportion of cement be greater or less; nor still further between such a wall and a breast-

work of native rock, with its natural bed and strata and still finer granulation. Nay, if we turn from constructions of brick or stone to applications of timber, a framed house may be held together as rigidly as if it were of one piece of wood, and may be liable to no other accidents of dislocation than if it were so; and lastly, iron framing again, with its struts and ties, is as much a composite beam as the framed wooden truss of a roof; and both are constructively equivalents of any solid marble architrave. The effective tie and strut do but localise the distributed functions of the molecular attraction of cohesion and repulsion that give to any beam of any material its specific rigidity,—which cause its atoms to be in such and such proximity,—bring them precisely so close to each other and stay them with specific force from becoming closer, under penalty of dissolution.

One head of Construction, then, may be taken to comprise the cases in which material is kept in place throughout, by the mere value of its natural cohesion, or by artificial union,—cement, clamps, trenails, &c., that can make portions that were separated originally, to remain united with an equivalence to natural homogeneity. There would be convenience in regarding any mass with these characteristics, whatever its magnitude and form, as comprised in the constructional definition of a *beam*. In either case and in all cases, building material,—material,—that rests upon other below, is exerting power that tends to crush, however this result may be perfectly countervailed and neutralised. If and so far as it occupies a place otherwise than in virtue of the support of material below it, a beam,—a natural or artificial, a simple or composite rigid mass,—has power forthwith as a lever or a wedge which, unless countervailed, must operate destructively. So a cornice-stone inserted in a wall may have its weight so distributed that, while it ever tends to crush the courses below it, it may act as a lever on the blocking course above it also, or may by its own weight itself break short off.

A free voussoir uncemented, or so loaded that cement gives way, acts as a wedge; technically, by the agreed definition, it is a beam in peculiar position, and, as a beam, tends to crush material in contact with it in vertical lines from the various points of its sloping sides; but the composition of vertical and lateral resistance to this power in varied proportion, gives to it a resultant direction more or less oblique,—produces Thrust. Crushing power, though conveniently distinguished with reference to attendant circumstances, does not essentially differ from thrust. Like that, it is a composite power, as being something more than simple push or simple pull,—driving or dragging,—so far as these, indeed, ever can occur absolutely simple. When a block of freestone is crushed, each grain of the stone becomes a wedge acting vertically and laterally on its neighbours, overcoming molecular cohesion in one direction and repulsion in the other. It is therefore against forms of disruptive leverage that act by steady compression or strain, singly or combined,—only exceptionally by percussive impact,—that Construction ever finds itself matched: Leverage, simple Crushing power, Thrust simple, or compounded as Torsion or twisting power, are expressions of modes of displacing agency, that it is ever under obligation, and vigilant to countervail.

Crushing by proper weight of materials themselves, may be regarded as the primary enemy of construction; to be met by distribution of materials selected for strength and weight,—by such confinement of weaker parts that movement shall be impossible,—and by merciful subjection to weight and pressure.

Leverage is either carefully deprived of opportunity of mischief by accurate adjustment of equilibrium, or it is safely defied by a distribution of weight that keeps the strain inactive.

Thrust,—if admitted a possibility of it must be,—is countervailed by increased strength in the part that is exposed and otherwise liable to displacement, as by buttress applied to wall, or by a weighting pinnacle,—*pondus addit robur*,—upon buttress. Otherwise, the activity of thrust is precluded by so locking in the parts that but for this would thrust, that they cannot even move among themselves. It is better still if the possibility of thrust can be precluded altogether, for, if once awakened, it is a force for mischievousness that never sleeps thereafter. Thus, if the voussoirs of an arch are so strong and so strongly connected that they are incapable of sliding on each other,—will not separate by their own weight, or any that they are subject to have placed upon them, they have no living thrust,—they become dead weight; and an arch so firmly composed is equivalent to a single perforated block,—a simple beam of definition.

Utterly abrogated, however, as all the prerogatives of thrust in such a case may be, the very form of arch will nevertheless suggest, by association, its existence; and, as a mere suggestion, this has to be taken into account, and has most important consequences when the arch comes to be treated and treated of, artistically. As repose is banished by mere appearance of topheaviness, however false such appearance may be to the fact, in the same way it departs as certainly from us when contemplating certain forms, unless there is intimation apparent of the constant presence of a counter and conserving power. Architectural Construction that pretends to be artistic has the double responsibilities that were incumbent on Cæsar's wife,—but there fulfilled imperfectly,—must be not more exempt from real lapse than from faintest possibility of suspicion.

In such cases the most delicate intimations of the presence of a power of the desiderated tendency may be quite as satisfying, and at the same time more graceful, than coarser demonstration. Even when buttresses are not more numerous or more massive than the security of the construction fairly requires, their services are often by no means accepted with grateful welcome when exhibited so broadly. We have to reconcile ourselves too often to tolerate them as publishing somewhat ungracefully a discreditable weakness in what they ostentatiously support, or encumbering with clumsy help, when not under suspicion of clustering over officiously where they are scarcely wanted at all. Not so built the architect of the spire of Salisbury.

The value of cusps in Gothic foliation, as of fluting in Greek columns, depends on the intimation, delicate as the lighter accents that decide the true feeling of a spoken sentence, of power that is present of a kind required and just in excess, however latent, of what absolutely suffices, to draw together what might seem liable to be strained apart,—to stiffen completely what were completely useless if less than completely rigid.

When Art shall take up the treatment of an Iron Order with a feeling that is worthy of the last developments of iron construction, we may hope to see forms that do well enough, whencesoever borrowed, to supply space and shelter at lowest contract cost, only above all most expeditiously, superseded by newly imagined and specifically appropriate expressions.

It is an exercise for Taste in its highest refinement, to determine how far Construction shall be patent both in exteriors and interiors. These are problems of proportionate adjustment for which theory can provide no numerical laws of guidance. When all joints, dependencies, and articulations are displayed in all crudity, they will be felt as commonplace, and resented as obtrusive, even on the exterior of a building, and much more so within. There the mind is ever well content that the very occurrence of a notion of insecurity as possible, whether countervailed or not, should be precluded where it may be, or only suggested when so it must be, to be simultaneously set aside by visible assurance that it has been provided against with a degree of ease that is best warrant for certainty. On such a point mistrust must be at rest; but it is more absolutely at rest when the signs of security appear to present themselves casually and naturally rather than at urgent summons; when they come with the demeanour of candid witnesses no more expecting to be doubted than disposed to resort in hot excitement to affidavit and vociferation.

It was thus that the Greek kept his constructive joints true in position, and then seemed to have done his very best to render them all but invisible, and yet as certainly not invisible, by perfection of finish.

It is on the same principle that the beauty of the nude figure gains sufficient expression of the indispensable healthiness of stability, from certain palpable betrayals of the hard bony frame, which yet is nowhere in sight, and scarcely to be positively followed,—from truthful swellings and sinkings of muscles as they proceed to insertions that are ever hidden, and by courses that are only gradually recognised to forthwith rapidly escape the eye. And so in the draped figure no less, the flowing and responsive folds display the spirit and action of the form below, by the very envelopments that withdraw its details from observation.

As regards interiors, an unveiled, over-frank revelation of architectural anatomy is fairly resented as especially offensive, incongruous; and even the "ornamented construction" that is urged upon us from time to time as fully adequate relief, at best only replaces the better efflorescence of construction into ornament; is crude in any case, and always apt to degenerate hopelessly into mere bedizened coarseness. But this is not the place to pursue the topic; the demonstrator of it will have no lack of subjects,—whether the bare masonry of unrelieved cathedral walls, the exposed rafters of roofs and leantos, or marked joints of vault-like or cellar-like public offices.

In popular phrase, an interior so neglected or maltreated looks unfinished or unfurnished, inhospitable, rude. The first necessities of life have been cared for even ostentatiously; the building avouches itself as stable and weather-tight; but beyond this scarcely recognises the sensitiveness of the frames of the inmates,—and as to their associations of refined delight, either wantonly insults or ignores them utterly.

The disturbing actions against which Construction has to provide, come into play chiefly in its arrangements for the support of heavy and lofty masses, and then for the spanning and covering of void intervals. The first of these cases is met exclusively, except so far as discharging arches are more or less usefully introduced, by adjustments of materials involving simple down-press; but in the case of openings there is an important option, and these may be spanned either by Trabeation, by employment of a simple or of a compound beam or truss supported at the ends, and requiring only to be made so secure from sagging as to exert there no leverage; or, secondly, by Arcuation, by employment of voussoirs so arranged as to involve a tendency, a certain liability, to thrust. It has been by preferential employment of one or other of these arrangements that architecture has assumed its most distinctive variations.

Greek architecture is conspicuous for its simplicity and purity in this sense peculiarly, that it did not admit of any form or application of the arch,—never recognised its use or even existence, and may not even have been aware of its possibility, though this is hard to believe.

All later styles that either admit the arch at all or resort to it whenever possible, employ also the beam concurrently, as the principle of all constructive stability, reliant ultimately of necessity on down-press. By further development the arch becomes the vault and then the cove, an important feature in the great basilicas, with their trabeative roofs, and only secondary minor arches; and then the cupola. Santa Sophia may perhaps be regarded as still the only building of importance that exhibits the full employment of beam, arch, vault, cove, and cupola in conjunction.

Somewhat cognate combinations were adopted in the intermediate Romance structures, which in more than one direction attained the dignity of specific styles; but Gothic, renouncing cove and cupola, found full exercise for invention in exhaustless development of arch and vaulting. Greek architecture is replete with traces and traditions of framed wooden construction; that nevertheless no incongruousness with an essentially stone style offends us, is due to free modification, especially by changed proportions. Gothic architecture threw off the conditions of its antecedents much more perfectly, and yet can it be tracked up to them continuously, step by step.

Let thus much, then, serve as general introduction, along with notes on the Value of Proportion in Architecture, and Characteristics of artistic Composition, to closer attention to the more special inquiries indicated as in view.

THE TUNNEL THROUGH THE ALPS.

IN consequence of the badness of the Italian postal arrangements, the worst on the Continent (some of the officials, we are told, can scarcely read writing), our correspondent's account of the Mont Cenis Tunnel, and the circumstances attending the opening of it, reached us too late for our last number. We give a portion of it in our present issue, though it reiterates some particulars already before the public:—

The train of twenty-two carriages left Bardonèche on the 17th inst., at 10·30 a.m., arrived at Modane at 11. Returning, the passage occupied twenty minutes.

To the small State of Piedmont are due the

initiating and carrying out of this wonderful work. The Italians, especially those of the north, are more given to science than literature. The Italian mind has no superabundance of imagination, and the literature of the present day abounds in translations of works of foreign authors.

In 1832, Giuseppe Medail, of Bardonèche, drew the attention of Carlo Alberto, King of Sardinia, to the great advantages that would accrue to Italy could a tunnel uniting Savoy and Piedmont be constructed, avoiding the precarious route over the mountains, so often impeded by snow and avalanches. The designs then presented by Medail to the king have been adopted, with but very few modifications.

After much patient waiting, and patient remodifying of plans and designs, presenting them to the Chamber of Commerce and Science at Chambery, and other fruitless attempts to impress the grandeur of his scheme on men in power, he died, without a hope that the great work would be carried out. With pleasure we found that the name of Medail was not forgotten when the names of the great workers in the scheme were recorded at the banquet. At some future period, when the financial resources will permit, a monument to Medail, the primo originator of the grand passage of the Alps, would find a suitable place at the south entrance of the Frejus tunnel, as would that of Waghorn by the canal of Suez. However, the well-studied plans of Medail bore fruit when he had ceased to live. In 1845, the Piedmontese Government saw the great advantages that must ensue could a railway communication be formed between Savoy and Genoa, thus introducing the commerce of France and Austria more direct than by Marseilles. The charge of preparing the necessary plans was confided to the Belgian engineer, Mans (who then held the direction of the Genoa railway) joined with Angelo Sismonda. The former had already acquired European fame by the new system of locomotion, called the "Inclined plane of Liége," applied by him to the Ostend Railway.

Sismonda was reputed as the greatest geologist and mineralogist of his day. After much careful research over that part of the Alpine range between Mont Cenis and Mont Ginevro, the site best suited for the tunnel was found to be that already indicated by Medail, and was adopted, viz., between Bardonèche and Modane. In 1849 a detailed project was laid before the Government. In it the length of the tunnel was fixed at 12,200 mètres, but commencing on the south side at an elevation of 1,364 mètres above the level of the sea.

To arrive at this height, Mans intended utilising his plan of the Liége incline plane.

Then the excavation of a tunnel of such length appeared to the engineer Mans impracticable with the usual methods; both time and expense were against it. He would have brought into use the torrents on either side for the motive power, and that from a fixed machine placed at the entrance of the tunnel. The political disturbances of '48 and '49 obliterated for the time all thought of the Belgian engineer, but each year came more prominently forward the need of carrying out the great enterprise, and the engineer Ranco was commanded to study anew the means of excavating the projected tunnel, and his results were accepted. Other men of science were also consulted. The greater part recommended the shortening of the passage, exposing it, however, again, by its elevation, to the insecurities attendant on the road *traversée*. One Piatto, of Milan, suggested boring by means of compressed air. This plan was rejected. Once the plan concluded that the road must not take too elevated a range, there remained only the fact that through the bowels of the mountains must the tunnel be bored, and that at a great depth.

On the 30th of June, 1855, were patented two inventions, which have tended to lead, with temporary alterations, to the present result. The perforating machine invented by Thomas Bartlett was one simply moved by steam power, but without means of providing air for the workmen. That of Colladon was a locomotive impelled by compressed air-power, whose pistons put in motion a series of tools for boring the holes by means of varied mechanism; but the means of regulating the air-power on the dynamic pressure so that the pistons should be available to act in the same manner as if moved by steam, failed. The merit of coupling these two inventions and adapting them to the perforating of the rocks is due to Grandis, Grattoni, and Sommeiller, who found a mode of compressing the air and regulating the necessary means of transmitting the accumulative force of the air to a great distance in order to serve the double end of moving the machine and giving breathable air to the operatives.

Aided by Cavour and Paleocapo, the consent from Government to essay the new method was obtained, and an experiment made with the machine, constructed in Belgium, on the rocks near St. Piero d'Arena, in April, 1857. Fears were entertained that the further the tunnel was pierced the more would the power of the compressed air fail, but both these, and those that the temperature would be greatly raised, proved groundless; the change, even at the distance of 6,500 mètres, more than half through the tunnel, proving ultimately to be barely perceptible by the workmen. Consequent on the success of the trial came the approval of the Government, and on the 31st of August, 1857, the King of Sardinia fired the first mine, thus inaugurating the great work.

Extreme care immediately was taken at both ends for the construction of roads, canals for the deflection of the water-courses, powder magazines, workshops, dwellings for the workmen, &c., and all with such celerity that at the end of the year 1857 the actual boring of the tunnel could be begun. In January, 1861, the sides of the entrance of the tunnel were carefully supported; the machine for perforating could be introduced. Two years later it began at the other end.

From that date it might be said that the difficulties were at an end. Time and patient continuous labour alone were needed.

The blasting—for *all* has been done with powder, — followed the scientific boring, the clearing the *débris*, the propping up of rocks at parts succeeded, as in all tunnelling.

From the commencement to the end, ten years of ceaseless labour have been given. On December 26th, 1870, a day that will be registered with pride in future annals, the last barrier fell that divided the important and accurately-designed works begun at each end, and French and Italian workmen greeted each other with fervid thankfulness. Troubles to the north clouded the joy, but the great labours had ended with success, and were hailed among themselves as propitious omens of better days.

The cession of Savoy to France had induced an International Convention, signed in June, 1862, by which France undertook to pay nineteen millions of francs towards the expenses, on condition that the works were ended within twenty-five years from the commencement. If finished before twenty-five years, a premium of 500,000 francs for each year was to be given. If before the end of fifteen years, a premium of 600,000 francs. This enabled the Government, in December, 1867, to make a contract with the engineers, Grattoni and Sommeiller, for finishing the entire work before the end of 1871, at the rate of 4,617 francs a mètre. The whole cost of the work is estimated at 75,000,000 of francs (3,000,000*l.* sterling).

The number of workmen employed in the tunnel was 1,500 in winter and 2,000 in summer. The village of Bardonèche, of formerly 1,000 inhabitants, had its numbers increased to 3,000; and the same was the case at Modane.

According to the project adopted, the gallery measures 12,220 mètres. The tunnel actual has not been the only great work done. Leaving Turin, the old rail goes as far as Bassoleno, when the train for Susa continues on the old route; that for Bardonèche starts for a new road about 40 kilomètres in length, and is divided by twenty-six tunnels passed before reaching Bardonèche.

The road passes the vale of the Dora Riparia four times, twice the torrents of Bardonèche, once the River Melezet, besides numbers of torrents and rivulets. The difference of the level between the point of departure and the mouth of the tunnel is 829 mètres; the medium incline about 20½ mètres in a thousand; the maximum, 30.

Hard compact rock has been cut through,—on the Savoy side quartz in great quantities; roads were supported with gigantic masonry; bridges made over torrents and precipices. All obstacles have been surmounted.

The entrance of the tunnel, which is 6·50 mètres to the top of arch, is found to be 1291·50 mètres above the level of the sea; on the south side or the north, 1158·96; at the culminating point, 1294·59. About 360 mètres are horizontal. The greatest incline is on the south side.

As was remarked at the banquet, two great suns are shining through this new opening,—that of the south in increasing splendour; that of the north only dimmed by temporary misfortunes; by it may commerce and peaceable relations produce for ever a fraternal unity between the two nations.

THE DUMB SHAFTS IN THE METROPOLITAN SEWERS.

SIR,—The dumb-sewer shafts you allude to in the *Builder* of last week are to be found in the old Westminster districts, as well as in other metropolitan sewer districts, at the intersections of streets, and also between these points at about 100 yards apart. They are covered with iron plates or stones. Formerly the deposit in the sewers was removed by lifting it through these shafts to the surface, and then carting it away. While I was surveyor I put ventilating grates over a few of them, and laid pipes from some into the nearest gullies, but there are a vast number without any ventilation whatever. Every one of them contains sulphuretted hydrogen gas emitted from the sewage, as well as coal gas escaped from the gas-pipes. There are, or were, books in the Metropolitan Sewers Office giving the situation of these dumb-sewer shafts, by reference to which they may easily be found by measurement on the surface. J. P.

CROYDON CHURCH: PAST AND PRESENT.*

OUR parish churches being the joint property and inheritance of the parishioners, it follows that the great bulk of Britons, exclusive of those in our modern manufacturing towns, have shares in ancient structures that are as interesting in an archæological point of view, as the mighty castle or the pleasant "house" of the neighbouring lord of the manor. In the great clusters of modern industry, the churches are chiefly new, for they have been erected since the conflux of population has called for more accommodation for public worship than that which the one fabric placed there in old time could afford. But in other parts of the country, agricultural and pastoral, John Bull and Jack Robinson are in possession of venerable structures, frequented by their forefathers, in Tudor, Lancastrian, and Plantagenet days. Many a parish church, indeed, as we needly scarcely say, now standing, was built only a few years after William the Conqueror's assumption; and, here and there, in quiet nooks, is still to be found a massy, hoary edifice, with sturdy low arches and thick ripe walls, that was erected a century or more before that doughty Norman so much as cooed or crowed in his mother's arms. To these hallowed still places, in every generation since they were built, Dame Bull, smiling and proud, has brought her little ones to be baptized, and sweet mistress Robinson has come, with pretty blushes, to be married. To say nothing, therefore, of the fact that it was beneath the shadows of their walls, and sometimes within them, that they buried their dead, the family history of parishioners must be allowed to be intimately associated with their parish churches. After a little more diffusion of archæological knowledge, indeed, we may expect an intense appreciation of these items of our mutual inheritance; and, in many instances, a deep unavailing regret that more care has not been taken of them. All those persons who have in any way assisted in the preservation of their parish churches, or of their records and monuments, or have in instances of demolition or conflagration perpetuated their remembrance by illustrations, will be held in good memory.

With this slight preface we are about to mention a work which seems likely to bring its author the recognition we predicate for those who render the services we have enumerated above. It is a history of Croydon Church, by Mr. J. Corbet Anderson, who, with his own pencil, has enriched it with about a hundred illustrations, showing the general appearance, monuments, and other details of his subject. Croydon Church, it will be remembered, was destroyed by fire, one stormy night in January, 1867. As the flames darted and leaped upwards,

* Monuments and Antiquities of the Old Parish Church of St. John the Baptist, at Croydon, in the county of Surrey. Illustrated by the author, J. Corbet Anderson, Croydon. 1871.

snowflakes whirled and fluttered and faltered downwards, and, what with the rage of the fire and the impediments to succour caused by the frost, the structure was completely gutted. Mr. Anderson has divided his work into two parts, therefore. The illuminated title-page of the first portion sets out that it contains "Monuments and Antiquities of the old Parish Church of St. John the Baptist, at Croydon, in the County of Surrey, which was destroyed by Fire, January 5th, 1867;" and another illuminated title-page announces that the second section relates to "The Parish Church of St. John the Baptist, at Croydon, Surrey, as it was Rebuilt during the years 1867-9, after the Designs of G. Gilbert Scott, R.A." Both parts are executed in a meritorious manner. And as the subject is good, the result is an agreeable as well as useful book.

Croydon Church possesses the interest of close neighbourhood to Croydon Palace, one of the ancient seats of the Archbishops of Canterbury, and within its walls have been interred several of these prelates. Bishops, too, have been consecrated in it. Archbishop Cranmer, especially, consecrated several bishops in it, among whom was Myles Coverdale, D.D., the translator of the Bible. These facts are duly dwelt upon by Mr. Anderson. For 800 years, he tells us, this was the only Episcopal church at Croydon; but the increase of the population has been so great and so rapid that it has been deemed expedient to form eleven additional districts out of the original parish, and eleven new churches have been built in them, since 1827. Thinking of this twelve-fold increase and the prosperity it denotes, it seems almost like turning over a bundle of hay to look for a needle to go back to those early days when the first Christian fabric was reared in the secluded and wooded valley, or dene, we now call Croydon. But that there was such a structure in the dene in Saxon times is indicated by the signature of "Elfsie, the priest of Croydon," to the will of Byrhtric and Elfswithe made in the year 960. There were no traces of Saxon work to be discovered in the building, even before the fire; but after the great conflagration, when portions of the walls fell and others were pulled down, a great many fragments of Norman work were found built up in later masonry. We may thus conclude that the first church was built of timber, and that it was superseded in the days of the Norman kings by a stone building. This was in its turn taken down to make way, successively, for thirteenth, fourteenth, and fifteenth-century work. Three times, it was seen, on examination after the fire, had the old walls been pierced for lights, the last being in the Perpendicular period. In Domesday Book there is an entry of a church and a mill at Croydon; but the chief remains left bare by the fire and the subsequent stripping off of all plaster-work are those of an Early English building. Thus, Mr. Anderson thinks, the church mentioned in Domesday, which was probably only the usual chancel and nave, must have been extended in the Early English period to nearly the full size of the large Perpendicular edifice recently destroyed; and it was the Early English masonry, always excellent, that had been thrice pierced. Externally, however, the structure that perished in 1867 was, to all intents and purposes, a handsome Perpendicular edifice. In the present restoration, this fact has been handed down, and Croydon Church once more presents the appearance of a costly Perpendicular building. By the aid of a small map, we are shown its position with reference to its ancient approach through Jennett-lane, now closed; its proximity to the ancient quadrangular court of the archiepiscopal palace and the vicarage; and its insularity by means of brooks and ponds. In the gardens of the palace were many fish-ponds. Most of these courses and pools have now, however, disappeared.

The ancient church consisted of a nave, with north and south aisles and north and south porches; a chancel, with north and south aisles and a sacristy; and a tower, five stages in height, at the west end. There was a west doorway in the tower, which was ornamented with the arms of Archbishop Chicheley, "the especial repairer" of the fabric, according to Stowe, in the early part of the fifteenth century; and over it was a broad mullioned window. At the east end was a large six-light window, divided into two stages by a transom, with tracery in the heading. Among other lights, those at the east end of the chancel aisles were remarkable for their beauty. The arcades of the nave consisted of five arches; and those of the chancel of two. The arches were moulded, and the columns clustered.

In the south aisle of the chancel were two handsome marble tombs, with recumbent effigies, one being that of Archbishop Whitgift, the other that of Archbishop Sheldon. Near them was a smaller monument, with a kneeling effigy to the memory of Michael Murgatroid, who died in 1608. Eastwards of these, in the chancel, were the fine sarcophagus and effigy of Archbishop Grindall. Illustrations of all of these are given, for, fortunately, Mr. Anderson made accurate and minute drawings of them twelve years before the fire. On the north side of the chancel was the tomb of "Maister Henrie Mill, citezen and grocer of London famous cittie, alderman and sometyme shreve," and his wife Elizabeth, who was the mother of sixteen children, "the blessing of the Lorde," said the long epitaph. There were two arched recesses, divided and flanked by Corinthian columns in this monument: in the one knelt the worthy alderman and on the other his wife, and these effigies being of stone, suffered less than the marble ones mentioned above; but they were taken down after the fire. In the north chancel aisle was the grave of John Singleton Copley. Here was also a Tudor monument, on which were represented in alto-relievo the figures of a man with four sons of graduated sizes kneeling behind him, and of a woman with five daughters, with a similar difference in their stature, kneeling behind her. On the tomb was the date 1568. Below was an inscription which stated that Sir Nicholas Herone was buried there. In this same aisle, a startling contrast to these stiff effigies, with their starched ruffs and prim robes, was a monument by Flaxman, in which the angel, with soft drooping wings, was stooping serenely over the form of a beautiful female in transparent drapery, and with both hands touching her outstretched arms to assist her ascent to the regions of light. This piece of sculpture was erected to the memory of Mrs. Bowling, who died in the twenty-fifth year of her age. It was completely shattered in the fire. Close by was a monument to the memory of Sir Ephraim Stannus, the lieutenant-governor of the Military Seminary of the Honourable East India Company at Addiscombe; and nearer still laid the remains of Lewis Nockalls Cottingham, the architect. On the floor were several brasses and slabs. Antiquaries, time after time, came and rubbed them and read them, and ever and anon the old monuments figured in their portly publications. Many of the brasses were torn out, leaving only their indents. This was the case on the Warham monument, where there were formerly brasses representing a knight and his lady, not on the floor, however, but on the back of the deep recess over an altar tomb. Mr. Anderson has sketched many of these. There were stones with indents for brasses close to this inscription, and two perfect brasses, one showing Sylvester Gabriel, a priest, who died in 1515, and the other a knight and his lady, with their coats of arms, and nine children. On the floor of the nave, too, were several brasses of a later period. One represented a comely young woman robed in a long tunic, which opened in front to show the rich skirt of a garment below. On her head was a high-crowned hat, with a broad brim turned up over her ears, and round her neck was a plaited ruff. This was Elizabeth, the daughter of John Kynge and Clemence his wife, who was married to the vicar, Samuel Ffynche, bore him five children, and died, at the age of twenty-one, in November, 1589. There was another brass of a lady in a high-crowned hat, ruff, and peaked bodice, close by; but both of these, with four others, we are grieved to read in Mr. Anderson's pages, were stolen by the workmen employed in improvements and repairs made in 1859. Besides brasses representing figures there were others charged only with quaint epitaphs. Most of the monuments, it will be seen, belonged, like the ornamentation of the edifice, to the Perpendicular period. When the church was cleaned in 1844 a distemper painting was discovered; and when the gallery, built in 1714, was removed in 1857, another painting, representing St. George slaying the dragon, was found on the same wall. These are delineated.

The register was commenced immediately after Thomas Lord Cromwell issued an injunction to the effect that entries of births, or baptisms, marriages, deaths, or burials, should be made in a book kept for the purpose, in 1538. The headings of each division in the register are written with many cramped flourishes and puzzling abbreviations, in Latin, by the curate, Thomas Sowdley. The first baptism entered took place on the 25th of December, 1538. It was that of John Butler. Mr. Anderson gives a sketch of the font, which was utterly destroyed in the fire, so it is easy for us to realise the ceremony. It was new in those days, of an octagonal form, with a quatrefoil in each of its panelled sides. In the centre of one quatrefoil was a rose; in the next, a grotesque face; and so on, alternately. The first marriage entered was that of Loye Balle and Alyce Cortys. This took place a month before the baptism of John Butler. We may picture the little cluster of wedding guests standing before the altar, the dames in high-crowned hats and ruffs and tunics, coquettishly worn open to show the embroidered undergarments, as Elizabeth Ffynche wore hers; the bridegroom in a doublet, with a cloak over it, by reason of the November weather, a ruff too, bows upon his shoes, and perhaps at his gartered knees. For, as we have said, most of the effigies on the numerous monuments belong to this time, and they give us all these particulars of costume. There are several interesting notices in this early register. One states that "from the 11th to the 18th August, 1603," the year after that of the death of Queen Elizabeth, "3054 persons died of the Plague in London and the liberties thereof, and that many died in the highways, neare about the Citie;" and "from the 25th of August to the 1st of September 3,385 persons died." The deaths of five persons are recorded who lived to be centenarians. Only one of these lived in the seventeenth century. The other four occurred in the eighteenth. Four of them were women. Mr. Anderson gives the entries relating to the burials of most of the persons to whom monuments were erected in the church. Some of the great frosts were also registered. In December, 1607, it was written,—"The greatest ffrost began ye ixth day of this month. Ended on Candlemas Eve." Against the date 1614-15, February 12th, there occurs,—"This was the day of the terrible snowe, and the Sonday followinge a greater." On the 31st of March, 1722, a note was made to the effect that six men were executed that day at Thornton Heath.

In the following year, in April, another entry records the execution of four more at the same place. In March, 1749, Robert Saxby was "robed and murdred" at the end of Breach-lane; and in the following August, "James Cooper, a highwayman, was executed on a gibbet in Smithden Bottom, and there hanged in chains," for the misdeed. There are seven entries showing the burials of seven archbishops. Most of these died at their palace close by. Two of them, however, were brought from Lambeth for burial at Croydon. In 1596 the death of Archbishop Whitgift, who stood by the side of Qeeen Elizabeth when dying, and afterwards crowned her successor and his queen, is thus recorded:—"John Whitgifte, Archbishop of Canterburie, deceassed at Lambith, on Wednesday, at viiij of the clocke in the eveninge, beinge the laste day of February. And was brought the day followinge in the eveninge to Croydon. And was buried the morninge followinge by two of the clocke in the chappell where his pore people doe usuallie sitte. His ffunerall was kept at Croydon the xxvijth day of Marche followinge. Anno Dni. 1604. *Anno Regni dni nri Regis Jacobi Secundo.*"* Archbishop Wake likewise died at Lambeth, and was brought to Croydon for burial. The record adds,—"And his lady, which was buried at Lambeth the April, 1731, was taken up and brought to Croydon the next day, and put in the vault with him." But we must now turn from the old church, and those who worshipped in it, to the new.

Mr. Anderson relates that the fire that swept so much of the past away was caused by the heating of the flue of a stove which was conducted too near to the woodwork of the roof:—"There was only a brick, set edgeways, in an ordinary amount of lime mortar, between the flue-pipe and the wooden upright that rested on the corbel. Between the dry timber and the iron pipe the space did not exceed 6 in." This being the case, it only required a better fire than usual to do all the mischief that was ultimately done. On the cold January day in question the stove was seen to be red hot; and about eleven o'clock at night a small flame was observed curling along the principal and tie-beam that

* Whitgift's Grammar School, Croydon, built by funds accruing from a bequest of the Archbishop, was recently illustrated in our pages (see p. 646, *ante*).

were so dangerously close to the fire. The Volunteer Fire Brigade was called immediately; but no one remembered to tell the turncock to turn on the water. Thirty-five minutes elapsed before water was obtained, and then it was too late. The roof fell in at half-past eleven. A south-easterly gale was blowing, and falling snow mingled with the sparks in a most dazzling manner. By half-past twelve only the outer shell, and that terribly scathed, and the shattered arcades, were standing.

As soon as it was lawful to do so, the vicar, who had previously employed Mr. Scott to put the church in order, called a meeting; the result of which was that the same architect was instructed to rebuild the edifice. And here commences the second portion of Mr. Anderson's chronicle. In November, in the same year, the work of reconstruction began. The old flint walls were recased as far as they went, with the exception of the east end, which was extended 18 ft. to give greater size to the fabric.

The ancient south porch, with the chamber over it, was retained; and the carcass of the tower was also used in the new structure. The tower is 29 ft. square, and 100 ft. high to the parapet. The pinnacles give it a height of 121 ft. The south porch mentioned measures 12 ft. 6 in. by 11 ft. 6 in. The length of the nave is 91 ft. 6 in.; the width, 32 ft. 6 in.; the height to the ridge, inside, 53 ft. 6 in. The chancel is 56 ft. long; thus, with the tower, giving a total length of 176 ft. Those who enter the church by the western doorway gaze upon a fine vista. There is an arcade of six lofty arches on either side of the nave. In the chancel are two more arches, supported on red marble piers, making eight, on either hand, in all. Over the arcades of the nave are six clearstory lights. And, higher still, pass and repass the timbers of the roof. Angels are carved on the corbels bearing the upright principals; and rich tracery is inserted in the spandrels of the tiebeams and braces. A handsome carved oak pulpit on a sculptured stone base stands at the north-eastern respond of the nave. Near the south-eastern pier is the reading-desk; and between the two, upon a marble foundation, is placed the ancient brass eagle, fortunately snatched from the burning. The chancel roof, which is wagon-shaped, is panelled and moulded. At the base of each intermediate rib stands an angel, erect; and the principals, as in the nave, are supported by corbels, each of which bears the half-length figure of an angel. The east window has seven lights divided into two stages by an embattled transom. As the eye follows the drooping, wing-like curves of the tracery in the heading, the thought of Flaxman's angel comes to mind, and we grieve that it has perished. This window, like others in the fabric, is filled with stained glass. Below it is a coloured alabaster reredos. That nothing may be wanting, there are handsomely carved sedilia on the south side, a credence-table, and oaken stalls with carved finials. Nearly every detail we have mentioned is figured by Mr. Anderson, and the names of the artists and manufacturers furnished by him. The cost of this restoration, with the purchase of the chancel, the warming apparatus, gas-pipes and fittings, organ, bells, clock and chimes, furniture, commandment tablets, with the necessary legal expenses and insurances, amounted to 30,000*l*. No accident occurred during the progress of the works. A high wind broke off the principal boughs of a great elm which grew before the tower; but no injury of more consequence cast a gloom over the prosperous progress of the task.

We are enabled to reproduce, as examples of the illustrations, Mr. Anderson's sketches of the pulpit,* a corbel, and a gurgoyle.

At length, January 5th, 1870, exactly three years after the disastrous fire, the new church was consecrated by the Lord Bishop of London. About sixty clergymen were present, and a large congregation. Before the service commenced, the vicar, attended by the churchwardens, ascended the tower, to be present when the new clock was formally started, and the hour struck for the first time. After the service, a peal was rung upon the new bells. With a record of the first evening service, held on the same day, when the church was filled to overflowing, Mr. Anderson's labours came to a close. We have given but an outline of the interesting history his book contains; but, doubtless, we have said enough to recommend it to many of our readers.

* See p. 766.

ST. JOHN'S, CROYDON: CORBEL AND GURGOYLE.

THE INSANITARY STATE OF SUNDERLAND: AND ITS CONSEQUENCES.

THE present year will long be remembered by the inhabitants of Sunderland. Last year, Sunderland was the envied of towns from the lowness of her death-rate from all causes; the registrar's returns showing it to be about 16 deaths in each 1,000 persons living, per annum; yet the destroyer was near at hand, and the current year had but well set in ere he appeared in the shape of *smallpox*. The first attack, commencing early in February, gradually spread in every direction, covering almost the whole town, although isolated parts appear to have entirely escaped, to which reference will be made before closing this article.

The borough of Sunderland comprises, in its population of 100,000 inhabitants and area of 2,784 acres, the parishes of Old Sunderland, Bishop Wearmouth, Monk Wearmouth, New Hendon, and others. In a few years the authorities have spent considerable sums in improvements; still much remains to be done towards remedying the present insanitary state of the whole place, without any exceptions that we could observe. 83,000*l.* appear to have been laid out in public sewering, exclusive of 35,000*l.* paid by private persons. Much has been done in flagging and paving; many of the main thoroughfares are highly creditable in this respect; an outlay of 64,000*l.* has been incurred by these works, independently of other sums charged the owners of property. A large additional sum has also been borrowed, to more thoroughly complete the good work already done. Nevertheless, it is our duty to write in severe terms of condemnation upon the general sanitary arrangements.

A perambulation in almost every direction reveals the fact of very deficient scavenging organisation. Many streets,—and not the older ones alone,—are simply disgraceful, the channels often resembling open sewers; indeed, it seemed to us that there was occasional evidence of as much sewage above as below ground.

Warren-street, with others, was disgusting: the gutters were strewed with animal and vegetable garbage, and were flooded with soapsuds and slops, amongst which could often be discerned the heads and entrails of herrings and mackerel. In warm, sunny weather, such refuse must add much to the redundancy of foul smells already characteristic of many parts.

Money is being spent by the Council in clearing away the worst of the many human rookeries adjacent to the High-street, and ventilating the localities by opening out breathing-spaces, although many must remain for years to come. Nevertheless, the aspect and sweetness of narrow lanes and courts require to be improved by a wholesome scavenging, with proper attention to the necessaries and backyards, in too many of which we noted heaps of dirt and garbage, and infringements of the most necessary of hygienic laws.

The epidemic has made havoc in these overcrowded courts and alleys, from five to ten cases of small-pox in a single house being no uncommon thing. Some blame is attached to the corporation for pulling down so much property without providing other abodes: hundreds from sheer necessity have been driven to the neighbouring courts and narrow lanes to cram the already overcrowded dwellings at enhanced rents.

In Sunderland parish the epidemic was so rife that the mortality of some weeks ran as high as 125 per 1,000. Sunderland is essentially a midden town, the proportion of w.cs. being less than one-fourth. From personal observation we should say much less.

It is, perhaps, remarkable that out of several hundred houses examined, not one of the necessaries or "netties," as they are termed, was drained. All emitted the usual smell of decomposing human ordure and rotting garbage, and in confined localities, on murky, moist nights, the stench is quite unbearable, from the confined nature of yards; many of these necessaries are within a few feet of the house windows and doors. The majority examined were in a more or less fluid state. Owing to this condition, a foul smell pervades the whole town, in every direction, the intensity being one of degree dependent upon local circumstances. In this respect our evidence is at variance with that lately given by a worthy alderman, who is represented as saying that it is a frequent remark of visitors to the town upon the entire absence of sewage smell. We can only say that the nose confirms what the eye detects, that the filth and abominations everywhere are felt and seen, and that the odours are in keeping with the conditions from which they arise. And it would be odd if it were not so.

Surely the sanitary authority of Sunderland knows that undrained privies, whose contents are in a semifluid state, are a much greater nuisance than when in a dry condition; that greater contamination to the atmosphere occurs through rapid decomposition, arising from the humidity of the foul matter, although comparatively inactive in a dry form, as easily ensured by proper drainage at the base. It was a common thing to note that the foul, watery matter oosed through the brickwork of the walls, saturating the yards and lanes with abominable filth. We fear this is a too common occurrence in this as well as other northern towns to be much noticed, for many persons remarked to us, "But what's the harm?" A tendency to aggravate the accumulation in middens arises from the imperfect arrangements for disposing of their contents; each householder removes his own by promiscous or chance carters, at a cost to himself of 1s. for each load.

Thus there becomes a tendency on the one part to accumulate filth because of the cost attendent upon removal, and, on the other part, a disposition to get rid of the load at the nearest possible spot,—for the manure is not much appreciated by neighbouring agriculturists,—without regard to locality or to any evils that may hereafter arise from the act: that some of it, at any rate, is deposited in the most improper places, we know of our own knowledge,—the sites of future houses!

Sunderland ought to know that this matter of the disposal of a town's refuse is of great sanitary importance, for good or for evil, to the community, and it can only be effectually performed by a proper and an adequate staff under skilled direction; it cannot be done in the present haphazard manner, and the cost should be borne out of the public rates. Above all other considerations, there should be no question as to the places of disposal being the right ones, as cannot now be said.

On visiting New Hendon, we found that the little Beck is crossed by an embankment some 40 ft. in height, known as "Noble's Bank." Now, this bank appears to be composed essentially of refuse of many kinds,—furnace slag, cinders and ashes, sweepings of roads and gutters, and contents of middens! The foul nature of the composition is disclosed by the condition of the water drained from the mass, and collected at the toe of the slope resting upon impervious clay, giving off countless bubbles of gas, and the whole water seems to be of the consistency of sewage in a concentrated form. The smell from this mass is unbearable at certain times, spreading far and wide, the inhabitants round about for a considerable distance speaking of the nuisance in no measured terms of disapprobation.

A similar bank is in course of formation a few hundred yards higher up the stream, and of similar materials.

As to the human filth deposited here, we have the testimony of the tenants adjacent, and the positive evidence of the foul water at the base of the stuff. The street scavengings we personally saw tipped here by the corporate carts. The nuisance and danger from this pernicious act are not merely confined to the present, for there is no question that in a few years the whole site will be built over; indeed, many of the houses now erected on each side of the stream are upon made ground of similar character. Let us hope that a Higher Power will have mercy upon those who dwell upon such filth, for the authorities have none!

Robinson-street, close at hand, consisting of fairly-built houses, let at 25*l.* or 30*l.* a year, and occupied by well-to-do tenants, presented an appearance such as to bring discredit upon any town, however well managed in other respects. The street is of considerable length, and for the most part well flagged; but of road there is none; just the ordinary black ashy formation with patches of clayey material; and it was a curious sight in the midst of summer to witness a straggling horse tugging at an inextricable builder's cart with the wheels sunk a full foot into the mire, with half a dozen passing pedestrians vainly aiding with their strength! But such we saw.

A much more serious matter is the want of sewers hereabouts. This street has two names; the one side is Robinson-street, and the opposite side is Herrington-street. Now parallel with these runs Ward-street, and between them a lane, for convenience of the back premises: to neither of these two streets thus back to back is there any sewerage whatever! The necessaries were for the most part filled with the usual semi-fluid contents, and the smell emanating from them is much easier conceived than described. It was plainly perceptible along the new Hendon-road at some distance; and, by tracing the stench, we discovered its origin. The household slops, with the wash-house and scullery water, are thrown down usually into the yards, and thence into the lane, the whole place being in aflood; indeed, many of the yard doorways have miniature dams thrown abreast of them, and with stepping-stones leading to the drier ground into the lane. Many of the privies leak, thus imparting a zest to the water from the houses. Opposite the worst of these places, new houses of a well-to-do type are in process of erection, and the whole soil—for it is here virgin soil—is saturated with this filth; the foundations of the buildings are cloyed. The primitive mode of utilising this local sewage is unique, and worth placing on record.

The Irish labourers, at the construction of the new buildings close at hand, have sunk small wells, into which some portion of the said sewage finds its way,—chiefly, however, from the surface, for clay lies below.

Now, the stinking water—for we smelt it—is used in the construction of these dwellings for mortar and plaster, for damping bricks, and other uses!—it appeared to be the only water; we could not discover traces of any other supply. No doubt this novel application of waste products will, in due season, bear fruit in the shape of ample crops of sickness in the unfortunate families who may chance to live here! Notwithstanding the evils of this ill-flavoured locality, not a single case of the prevalent smallpox epidemic has occurred, yet there was plenty close by. We will refer to this again, and offer an explanation of the apparent anomaly.

The sewers of the town, judging from the contour of the ground, must have, for the greater part, excellent fall. They are discharged into the tidal Wear or the sea, the water within them and the pressure constantly varying with the ebb and flow of the tide.

The ventilation of the sewers is not satisfactory: writing from our own inspection, there is an almost entire absence of it. Certainly whole districts have not a single outlet but that due to improper leakage. Mr. Harrison, C.E., from the Home Office, very properly refused the authorities his certificate lately for borrowing powers, until he had a guarantee that proper ventilation would be provided; and we hope, for the town's sake, that he will see the guarantee performed; for, notwithstanding the testimony of the sanitary and other committees and of the corporate officers, that every part of the town was sewer ventilated by means of drop-spouts, we are bound to state, that after examining numerous districts, and making many inquiries, we only found evidence of the fact in one single street, where there were either two or three such ventilators. Moreover, several practical builders of the town stated to us, they had never seen such things, nor even heard of them, and were surprised at the question. It ought not to be omitted mention, that according to information from a member of the sanitary council, the town sewers have capital ventilation, by means of six chimney-stacks, into which branches have been run. We saw the statement in a ludicrous light. Conceive, if you please, half a dozen chimneys, indiscriminately selected, doing duty for many miles of public sewers on an area of close upon 3,000 acres!

The pernicious effects of non-ventilation to sewers cannot be too well known nor too strongly denounced, and wherever sewers open into tidal waters the evils are aggravated. Gases foul and dangerous will generate within the sewers, and if exits for the gas do not exist at the *summits* of each, will find a way into the houses, outhouses, or yards, and of this there is no doubt whatever.

Not alone the sewer gases may enter these improper places for their reception, but what is of greater consequence and danger, also the contagium of any communicable disease that may happen to be rife in any part of the town wheresoever, provided there is a connexion with the sewers of each locality.

We examined the houses of a great many families wherein small-pox either had been or then was prevalent, and even on a cursory in-

spection grave sanitary defects were seen in most of them.

In by far the greater number of dwellings examined the slops are conveyed to a drain in the yard, so that contact with the sewer is broken from the outside. Nevertheless, a sewage smell was perceptible, and in some instances in a marked degree, with few exceptions, in all the houses looked into. More especially was the odour discernible in rooms not so frequently opened, in cupboards and small closets under the stairs, and similar close places. Numbers of the occupants were unaware of any foul smells, excepting at times, particularly after rain; others, again, stoutly denied the presence of foul odours, although when pressed, and their attention called to the locality of the noxious smell, they admitted they did at times perceive such, more so in the morning, when the house had been shut up, and the windows and doors kept closed; others, again, were loud in complaints of foul odours, arising they did not always know whence, but apparently from under the floors and passages. We will give a few extracts from our note-book, of memoranda jotted down on the spot, and selected promiscuously from a considerable number,—probably several hundreds.

"Tower-street, No. 29. Five small-pox cases here. All but infant vaccinated. Children under five years old. One death. Foul smells perceptible in the house. Tenants do not generally complain of it. Yard drain good. Not much smell from privy, which has not been cleansed and disinfected."

"No 28. One slight case. No apparent defects in the house, but the same characteristic sewage smell is obvious. The same in washhouse. The yard has a foul privy, smelling fearfully."

"No. 27. Wife died of small-pox. Had complained of the terrible stench from Noble's Bank. Necessary very foul."

From this house we had information that a person opened a mattress upon this bank whereon a small-pox patient had been laid: that a number of children had rolled amongst the straw, afterwards suffering from the same complaint. We are unable to confirm this.

"No. 7. Four cases, aged from seventeen to eighteen years. All vaccinated. Recovery uncertain. Privy quite full, and the stench caused a retching. The fluid percolates into the yard through the brick wall."

"Norman-street, No. 37. Here one child died. The ground-floor front room smells powerfully. In it the child slept and sickened. Twenty-two persons live in the eight rooms. Most of the houses in this street have had cases of small-pox. It is situated in the outskirts, near to the sea and fields, and on elevated ground. All the tenants complained of smells. Many of the houses are filthy, with foul yards and stinking privies."

In No. 46 (five cases, with one death), the smell in this building is quite sickening.

"No. 47. Stench again overpowering, of which complaints are made."

"No. 27 has eight cases and one death, all vaccinated. Twenty-four inmates reside in the eight rooms. Water from privy flows over its floor. Drain stopped, and yard filthy. No. 19 has one case. No. 20 has two cases. Great complaints are here made of the foul smells in the house. Stench of privy is very strong. Several of the drains in this neighbourhood are broken, emitting gas. No. 12 has one case. Tenant states that at times the smells make her quite sick. Another tenant in this house complains of a terrible smell arising from beneath the floor of the room. No. 7 has one case. Again are complaints of smells from the floors; it is stated that a pair of boots placed under the bed becomes covered with green mould in a couple of nights! The whole place is foul and stinking."

Robinson-terrace, close by, in a capital position, dry, airy, and fronting the meadows and sea, is worse in some respects than the cases just quoted; and the complaints of disagreeable smells within the houses are more general, and of violent headaches and lassitude in a morning, which disappear in the open air.

Many cases of small-pox have occurred hereabouts. The Parade, occupying a capital site, has many small-pox cases, and the most insanitary state prevails.

Going from house to house in various localities of the town, we found all presenting the typical foulness of—privies and gaseous escapes within the houses—what we should term "the Sunderland odour," for it differs from the noxious smell of other towns with which we are acquainted.

The number of sufferers *said* to have been vaccinated will surprise those who, like ourselves, believe in its efficacy. We should require further proof that it was as stated, before reasoning on it. Even here, however, vaccination is seen to be, if not a prophylactic against attack, in a great measure a preventive of death. It is asserted that something like 90 per cent. of the total population of this borough have been vaccinated, and that 85 per cent. of the whole cases of small-pox are vaccinated ones. The relative death-rate appears to have been about 5 per cent. in the vaccinated patients, but 60 per cent. in those not vaccinated.

These figures must be taken as approximate, and the final relations may differ from them: at the same time the medical officer concurs as to their general accuracy.

As comparatively few houses had sinks or traps within-doors, we were puzzled to account for the presence of so much sewer effluvium, until a builder, who erected some of this property, let us into the secret, incidentally, on being interrogated upon the provision against damp. It appears that a special pipe-drain is usually laid down parallel with the buildings, just under their front, and that a branch is provided for each house running under the floors (there are no cellars), for the purpose of carrying off any subsoil moisture from the foundations.

At the termination of each main drain before connexion with the sewer, a syphon pipe is supposed to cut off aërial connexion between the two. Vain delusion!

Here then, if this be correct, would seem to be ample provision for the general diffusion of an epidemic; indeed, for this purpose nothing could be more ingenious. Conceive the whole sewers of a large town, the tidal waters flowing up them twice in each twenty-four hours, emptying their gaseous contents under the floors of the houses of the unsuspecting inhabitants!

No wonder that the waterman's boots seen under one of the beds had turned of a mouldy green, and that sick headaches are constant. Here is ample text for a warning that should not be disregarded. Evidence shows that a town in even the most insanitary condition may for a time escape the consequences of infringement of nature's laws; but the penalty is fully imposed, and amply paid directly an enemy appears.

In the absence of sewers, and, therefore, sewage gas, in the houses of the abominable localities first referred to, such as Herrington-street, may lie the secret of their escape from present attack, and the explanation may be extended to other parts. The severity of attack in the outskirts of the town, as the Parade, Robinson-terrace, with the others around its whole circumference, may, perhaps, be attributed to their occupying positions at the termini of the sewer systems, where occurs the largest concentration of gases, and only their naturally healthy and elevated sites, with general openness of country, have saved them from even a more terrible fate than has befallen them.

THE RUSSIAN "BANYA," OR VAPOUR BATH.

THE Russians are great lovers of vapour-baths, and both the capitals contain a great number of these establishments, affording generally a profitable investment for the proprietors, who often amass considerable fortunes. Not only the capitals, but the towns of the interior, are provided with this desideratum in the economy of the every-day life of a Russian; and in every village the bath-house "banya" forms part of the peasants' establishment, although, as might be expected, it is rude and primitive, both in structure and arrangement, but the principle is the same. On Saturday evening, or on the eve of a great church festival, an unusual movement may be seen, particularly among the lower classes in Russian towns,—whole companies of soldiers, troops of mechanics and labourers, whole families, men, women, and children, are eagerly traversing the streets, with towels under their arms, containing their "change" of linen, while in one hand they carry the "vaynik," a bunch of birch-twigs, the use of which will presently appear. They are going to and returning from the bath. This propensity for bathing, or rather washing, among the lower classes of Russians, is an anomaly. During the summer months the rivers also swarm with bathers. It is no exaggeration to say that their habits are of the dirtiest, both as regards their persons and their domestic affairs; yet they will repair regularly to the bath. These periodical ablutions may therefore be looked upon more as the result of a confirmed habit, acquired from infancy, the sensual enjoyment which it affords, and also, in no small measure, to the curative properties which the bath is supposed to possess. Toothache, rheumatism, catarrh, and more complicated ailments, are all treated with the bath,—in fact, it is still looked upon almost as a panacea for all the evils that flesh is heir to by a great bulk of the Russian people.

The Russian bath, in its arrangements, may be regarded as a modification of what is termed a Turkish bath in this country. In the capital of St. Petersburg they consist of a spacious public dressing-room, where the attendants take charge of the clothes, which are ticketed, and placed, under corresponding numbers, into large pigeon-holes, made for that purpose. This room is more or less elaborate for the middle class of bathers, who pay about 5d. entrance. The floor is generally covered with matting, the couches upholstered with American leather or Utrecht velvet, which, with the looking-glasses that decorate the walls, constitute the furniture of this department, where shaving is also practised. The next apartment is what is termed the "milnaya," lavatory, or cold bath, which is only so comparatively speaking to the following one, which is the "hot bath." These chambers have boarded floors, the walls being wainscoted; but the lighting is bad, as a rule. The former apartment is generally the largest, is lofty, and will contain no less than from 60 to 100 people, including the washers, who receive an extra gratuity, the latter performing the operations of shampooing much in the way in which it is practised in the Turkish baths in this country, the friction, or rather washing, being effected by means of a large bast-wisp and a lather of soap and hot water, the patient being the while stretched out at full length on a wide bench, the head resting upon a small inclined plane of wood.

All the accessories are of wood, the benches fixed around the apartment and the pipkins for holding the water, hot and cold, which is supplied *ad libitum* from a system of brass taps, generally arranged in a circle in the middle of the bath-room. The "douche" is also to be found here as well as the ordinary dipping-bath. The next apartment constitutes the "hot bath." This is usually much smaller than the former one, not so lofty, and is the vapour bath properly speaking, and which the bather enters after the operation of a thorough scouring with the bast-wisp has been effected. Its arrangements consist of benches and a raised platform constructed near one of the walls, about 8 ft. high, formed of steps sufficiently wide to admit of a sitting, standing, or reclining posture. These steps, from three to four in number, represent graduated degrees of temperature, the top of the platform being the hottest. In one of the corners of this chamber is the oven or stove filled with boulder stones, which are kept red hot, water being now and then thrown upon them to generate the steam. The temperature maintained in this apartment is generally about 90° to 125° Fahrenheit. The "hot bath," it should be remarked, is the resort only of the thorough bath-goer. Here he lies on the platform alternately on his back and stomach, inhaling the heated and transparent steam in a half-gaseous state, his skin glowing a crimson red with the perspiration running down in streams. The Russians call this operation steaming themselves, and indeed it is the nearest approach to being cooked by steam that can well be imagined. The lover of the hot bath undergoes yet another operation,—that of whipping himself or being whipped with the "vaynik," which consists of birch twigs with the leaves on tied together into a bunch, and forming a sort of whisk, about 24 in. long. The operation of whipping, which is the invariable accompaniment of the steaming process, is effected by dipping the "vaynik" into cold water and slightly beating the body with it, producing a violent stinging sensation that seems to penetrate to the very marrow of the bones. This produces increased transpiration.

We have been describing a public bath in the fullest sense of the word, and conducted on decidedly primitive and communistic principles, for the costume of nature, in which we so entirely resemble each other, is that which prevails in this class of baths. The department for the women is arranged in the same manner, and in the baths for the lower classes a similar arrangement is introduced, only everything is of

a rougher description. The payment to these baths is about 2d., English money. For those who can afford to pay an extra price,—from 3s. to 5s.,—there are private baths, the miniature of those described above. These are more elegant establishments (on the same premises), where everything,—antechamber, dressing-rooms, and baths are perfect in their kind.

It would appear that the Russian vapour-bath is a very ancient institution. In olden times nearly every large house or establishment had its own bath; besides there existed for the common people the so-called Czar's baths, where a small charge was made for the use of them. These baths at one time formed all over the empire one of the sources of the revenue of the Czars. According to the account of Mr. Kotoshikhin, a great authority on Russian ancient manners and customs, the amount of 2,000 roubles was yearly received by the Czar's treasury from the baths under the jurisdiction of the Konyoushenny Palace alone. The public baths were generally heated once and sometimes twice a week. During the hot summer months it was forbidden to heat them, for fear of accidents by fire; exceptions were, however, made by the voyevodas or governors of provinces for invalids and women who resorted to the bath to be confined. In olden times, Mr. Kotoshikhin further relates, these baths were usually visited after dinner, no one fearing any dangerous consequences, although the heat was next to unbearable. On the floor and benches hay was usually strewn, and covered with linen cloth. In these days a Russian would lie down in the scalding steam, and order himself to be well beaten with the "vaynik;" he would then run out into the open air, and in summer time throw himself into the lake or river on which these baths were generally situated, or, in winter time, roll himself in the snow or pour pailfuls of water iced over his body in the hardest frost (this is constantly done now, even by the peasantry in the villages). Every one going to the bath always underwent the process of being steamed, — that was the universal custom. The public baths had two departments, one for males, the other for females, divided only by a slight partition, but the entrance was general for both sexes; and the men and women going in and coming out by the same door were wont without any sort of embarrassment to pass the compliment of the day to each other, or stand chatting together, the only covering assumed for the occasion being the "vaynik" before mentioned. In still more ancient times, Mr. Kotoshikhin says, it was the custom for men and women to bathe together, and even monks and nuns used to wash and undergo the process of steaming in each other's company.

It is related that at a later period the foreigners residing at Moscow had also adopted the Russian bath, but with several improvements, so as to have acquired some celebrity. Instead of the bare benches they introduced mattresses filled with sweet-scented herbs in the dressing-rooms, which were wanting in the old Russian baths, and altogether a more cleanly mode of proceeding. The bath in olden times was the chief cure for all complaints: as soon as a Russian felt himself indisposed it was his custom to drink a glass of an infusion of spirits and garlic or pepper, eat some onion, then go to the bath to wash and steam himself. It is considered that upon the whole the Russian bath acts beneficially on the lower classes, who have much exercise, and it is said to inure them to that extraordinary insensibility to the extremes of temperature which has so often astonished foreigners. The effect upon the higher classes of a frequent use of the bath is in the long run weakening, especially for persons accustomed to a sedentary life, owing to the reaction which follows the extraordinary excitement or kind of intoxication of the whole nervous system.

ANOTHER TOWN IN SOMERSETSHIRE.

THE town of Shepton Mallett, or Malet, is a town in Somersetshire with a surprising number of aliases: it may apparently be called Shepton Mallett, Shepton Malet, Shepton Mallet, or Shepton Mallard even, with an equal amount of correctness. It is a straggling town of about 3,000 or 4,000 inhabitants, situated in a valley, the north side of which is the southern side of the Mendips. Through the valley runs a stream; and, with the exception of just the heart of the place, the town through its whole length of about a mile borders the stream.

It does not strike a stranger at once that an immense amount of business is done in the place, or that it is an excessively lively or go-ahead place. It is not a corporate town. There is a high constable, but his office is nominal. The local authorities are the trustees of the Shepton Mallett turnpikes.

Two turnpike-roads, running at right angles, divide the town into four unequal portions. The other roads are, singular to say, maintained by the Highway Board, the turnpike trustees, as the local authority, doing all the scavengering, sewering, paving, lighting, &c. Shepton Mallett has had, however, waterworks for some years that supply water of a fair quality: in that it is far ahead of most Somerset towns. There are gasworks, but the company do not possess an Act of Parliament.

The turnpike trustees govern the town under three or four Acts: the most recent is dated 1791,—eighty years ago. Under these Acts, the trustees cleanse, pave, and light the streets, make sewers, and water the turnpike-roads that are within the boundaries of the town (the other roads they have no power to water), and have the powers of a local Board of Health in a most modified degree, and as far as sixpence in the pound goes. They cannot levy a higher rate than sixpence in the pound in the year, but they possess the further power of aiding that by imposing a double toll at all the gates in their trust on Sundays. This brings in, we believe, about 40*l.* or 50*l.* less than the sum of the sixpenny rate; and, as the whole of the sixpenny rate, save about 30*l.*, is used to pay for the lighting alone, these powers have been put in force for some years; but surely this is an injustice to the bondholders of the trust, and an evil that requires immediate attention. If from 100*l.* to 200*l.* can be so levied (though we have a great objection to an extra Sunday toll), that should go to the relief of the debt on the trust, and not towards the relief of the rates of the town of Shepton Mallett; it is, moreover, an injustice to charge travellers nine miles off with the relief of the rates of a given town.

The fruit of so restricting the turnpike trustees is evident in another way. You cannot expect a man to fight if you first tie him hand and foot, and so in this case progress is stifled, and fighting against the effects of time is impossible. Eighty years have elapsed since the date of the last Act; need we say how civilisation has progressed, or how its wants have increased in a proportionate degree in that time. Surely Shepton Mallett has been forgotten.

The trustees are continually making little improvements that lie in their power. Every year for the last few years they have laid short lengths of sewers and have put down a small portion of tar concrete paths. They have done all they can, and credit is due to them for the large amount of work they have done with such small means; but so much remains to be done of the utmost importance that is completely out of their power to do that we feel called upon to direct attention to the town. Some few of the inhabitants appear alive to the needs of the place, though they are all at sea how to act.

Into the stream that runs, we have said, through Shepton Mallett, are emptied all the sewers of the town. On its banks are many *garde-robes*; three breweries drain into it, and the new brewery, the largest of the whole, will drain into it near Bowlish. The bed of the stream is covered with loose stones lying on rock. In places it is arched over; in some places it is built over; for the most part it is open. It runs on to the village of Croscombe, about two miles further down the valley towards Wells, and from thence there are, of course, constant complaints of the ill odours arising from the stream.

The duchy of Cornwall claims the stream. You see the whole affair is an entanglement, and they will not take a step towards its purification. Surely the duchy, if they will not do it themselves, should insist (if the stream is theirs) upon its being kept free from sewage taint; the vapours and odours from it are fearful, noxious, and nauseating to a degree. An intercepting sewer should be laid at once in the bed of the tream, and conducted to a proper outfall.

If the duchy insisted upon the purity of the stream, the great desideratum of the town would be at once gained,—a local Board of Health possessing greater powers than the turnpike trustees now possess. At this time the streets are pitchy dark, for the lamps are only lighted from Michaelmas to Lady-day, and then for half the night only. For all the parts of this long straggling place, except the turnpike-roads, there is but one scavenger. Sewers are wanted in all parts of the town, and many of the existing old dry stone-wall drains should be destroyed, and proper ones constructed.

We hope we have said enough to draw immediate attention to the sanitary wants of the town of Shepton Mallett: if not we shall recur to the subject. PRO.

FREAKS OF FUNGI.

ALLOW me to add a few words of additional information to "A Church Builder's" lively article, and to explain what the "fine powder like brickdust" really is, that is at times found on china, &c., near the dry-rot fungus (*Merulius lacrymans*).

This excessively fine red powder is no other than uncountable myriads of the reproductive spores or *seeds* of the fungus; they are red in colour, and are produced on the surface of the fungus in millions. Certain privileged cells on the face of the fungus are furnished each with four minute points at their apex, each four bearing a single brick-red, egg-shaped spore; so that the fruit is spread over the surface of the fungus in groups of fours. To see the form of these spores the highest powers of the microscope are required, and then they can only be viewed as transparent objects. With a micrometer I have readily measured them, and the length of each individual spore is ·00035″ and the breadth ·0002″ of an inch.

If these excessively minute bodies be allowed to fall on wet flannel, damp blotting-paper, or wet wood, they immediately germinate and proceed to reproduce the parent fungus. The red skin of the spores cracks at both ends, and fine mycelial filaments are sent out: this is the "*mould*," spawn, or mycelium from which the new fungus will (under favourable conditions of continued moisture) appear.

To see these germinating spores with their cracked skins, the moist blotting-paper, flannel, or wood must be gently pressed on to a piece of thin glass (so that some of the bodies are transferred to the glass); then viewed with a microscopic power enlarging at least some 800 diameters. FUNGUS-EATER.

THE ORNAMENTAL ROCKS OF CORNWALL.

THE employment of the granite and porphyritic rocks of Cornwall ornamentally, is of very recent date. Indeed, it has been said now that, as Sir H. De la Beche said thirty years ago, they have been much neglected. Their variety is almost infinite. There are first the ordinary gray or bluish gray even-grained granites of the Cheesewring, Par, or Penryn, and the porphyritic granite of Lamorna Cove, with its large crystals of felspar; each and all of which when polished look exceedingly well. It is, however, to the less widely disseminated porphyries and elvans that we must chiefly look. Among these are to be found every variety of combination and tint which the admixture of black, brown, white, red, gray, and purple, in crystals, grains, and specks, can produce. Of the granites and elvans, some are white with black specks; others flesh-colour mottled with white or black; others, again, are a chocolate hue, with gray spots; and some are red and black. Sir H. De la Beche refers to a few of those of Fowey, in his "Report on the Geology of Cornwall, Devon, and West Somerset." He mentions also a light-brown granite from Castle-an-Dinas, near Penzance; a variety with purplish felspar near Gwennap; one with rose-coloured spar at Cligga Point; and a porphyry with felspar crystals of a greenish hue, in a light flesh-coloured base. He speaks likewise of a white granite found near Okehampton, which resembles statuary marble. The extreme hardness of these classes of rocks, though it causes them to keep their polish, is against their very general use; but certainly more might be done with them than at present, if some practical man were to take up the question of their ornamental utilisation from a business point of view; and especially if what is said of the working of hard stones by jets of steam and sand be true.

Beautiful as are the marbles and the granites, they must yield place to the serpentine of the Lizard. Of this, says the *Western Chronicle of Science*, there are two (speaking in an ornamental sense) distinct varieties—the green and

the red. The latter appears to be the most popular; but the former is the most beautiful, particularly in those cases where the olive-green base is traversed by red veins. Yet there are some purposes — such as chimney-pieces — for which the deep, warm tone of the mottled red kind renders it preferable. The principal characteristic of the Lizard serpentine is the richness and body of its colouring. One seems to see beneath the surface. We have classed the serpentine roughly, as green and red; but for those who are not acquainted with this stone, it should be added that the varieties of tint are almost endless. Associated with the serpentine is the diallage rock (small crystals of diallage are disseminated through a good deal of the serpentine) or Crousa Down stone, the principal tints of which are purple and green.

Among matters of minor importance may be mentioned the steatite veins in the serpentine, some of which are large enough to be used for ornamental work; the flints and chalcedonies associated with the chalk and greensand in the east of Devon; and a variety of red jasper occurring in large blocks on the north of Brent Tor, Tavistock. Spar, of which the varieties in Cornwall and Devon are almost endless, and some of which are as good as the famous Derbyshire spar, has never been taken in hand, and its capabilities are quite undeveloped, yet it might be used with great advantage and effect in the more delicate kinds of interior decorative work. Rock crystals have occasionally been employed for these purposes, but (in former days) more frequently for jewelry, under the name of Cornish diamonds.

THE SHEFFIELD SAW MANUFACTURE.

FIRST, the saw is cut out of the sheet. If a heavy or large saw it is next toothed, while soft. The third stage is that of hardening. Placed in a structure like a baker's oven, and floored like a baker's oven with brick, the saws are left there to harden, and when they come out they are, when cooled, brittle as glass. To abate this brittleness they are put into a composition, where they lie for a time in a sort of oily bath. This makes the fourth stage. After this they are tempered over a coke fire, watched by men who, guided by their experience of colour, take them out when they have acquired the tint which will leave them with a bluish hue that indicates to his practised eye the amount of elasticity in them. At this point you may bend them like whalebone from heel to point, so elastic have they become. This makes the fifth stage. The tempering warps them, and they now require to be flattened. The flattening is the work of the "smithers," who hammer and beat them into an attitude of precision. This makes the sixth stage. Now the blades have to be ground and glazed. This makes the seventh stage. The saws being now flat and bright have their teeth "set," by the laying over of the teeth alternately, and with the setting the sharpening is associated. This makes the eighth stage. At this point it is necessary to restore to the saw-blade the measure of elasticity which has been taken from it by the processes of rubbing and glazing: so it is put to heat in the oven; for the mere rubbing or glazing of the saws does somehow or other extract from them a large amount of the elasticity imparted to them by the tempering process, and for this reason they are heated to restore to them their lost suppleness. This makes the ninth stage. When they come out of the oven, they have on them a sort of straw-tinted bronzing, which has to be removed. To remove it they are placed in a bath, which immediately takes it off. This makes the tenth stage. The saw has now to be etched. This is the eleventh process. If a hand-saw, it now needs the hold for the hand or handle to be put on, and this is done with remarkable dexterity, and when done the twelfth stage is completed. Nothing remains now but to have the saws examined. Messrs. Spear & Jackson, of Sheffield, make circular saws of from 1 in. to 10 in. in diameter. These miniature circulars are exquisite specimens of the saw-maker's art, and are chiefly destined for Paris, there to be employed by silversmiths and others in the production of those beautiful and ornamental articles for which Paris stands unrivalled. They also make saws on models which it is proved are from two to three thousand years old. These are for the Hindoos, and have the teeth set towards the handle, so as to cut by the up-stroke instead of the down.

Saws are of an almost infinite variety—some narrow as lengths of steel tape, some round and broad as a cart-wheel or the top of a large loo-table. Some have beautifully small teeth, others have teeth larger than those of a horse. Some are destined for the most delicate operations of fancy cabinet work, and some are to be employed in sawing Bessemer steel rails by steam, at the rate of 800 revolutions per minute, while others are framed to spin along with a rasping sound all day long, cutting their way through the largest logs of timber in the naval dockyards.

The saw trade is a very ancient one, for the saw itself is figured on the ancient monuments of Egypt and Babylon. The cutting out of the edge in the form of teeth is done by machines, and where the teeth are small it is done at the rate of 400 per minute. The usual way to set the teeth is alternately to the right and to the left before completing the saw; but in the East, where ancient usages are preserved, the teeth of the large saws are bent aside in groups of perhaps a dozen each. The sharpening and setting of a saw require considerable skill of hand and accuracy of eye; for if any one of the teeth projects either edgewise or sidewise beyond the true line, it renders the sawing harsh and difficult. When the teeth of a hand-saw become blunted by use, they are sharpened again by means of a three-square file; but previously to this comes a necessity for turning the saw to the fire, where it is heated.

THE WATER SUPPLY OF CROYDON AND OTHER TOWNS.*

THE waterworks at Croydon were designed to furnish a supply at the rate of 2,500,000 gallons per day. The supply at present furnished to the district often exceeds the volume the works were originally estimated to furnish. On the 14th September, 1869, I reported to you for the week ending the 13th of that month that 17,883,633 gallons, or 2,544,765 gallons per day were supplied. The average daily quantity of water supplied to the town for August and September, 1869, was 2,528,160 gallons. The average daily consumption of water in this year 1871 for January, February, and March, was at the rate of 2,534,954 gallons per day for the town supply, and 118,829 gallons for the public baths, making the total quantity of water taken from the wells 2,653,783 gallons per day.

The population of the water district has increased from 26,669, in 1864, to about 50,000 at the present time. The progressive rate of increase may be arrived at from the following figures:—

In 1864 we supplied in the district 408,805,000 gallons; in 1865, 399,800,000 gallons; 1866, 441,276,000 gallons; 1867, 504,000,000 gallons; 1868, 745,400,000 gallons; 1869, 845,100,000 gallons; 1870, 771,300,000 gallons.

In four months of this last year a diminished supply of water was given, as the large engine was in the hands of the contractor. During three months of the present year we have supplied 230,680,810 gallons.

In 1867 the supply (to 4,614 houses) was distributed by 7,062 taps, 6,136 water-closets, 196 baths, and 22 fountains. In May, 1868, there were 7,032 houses supplied by 8,765 taps, 7,573 water-closets, 208 baths, and 26 fountains. In 1869 there were 7,697 houses supplied by 11,005 taps, 9,416 water-closets, 284 baths, and 27 fountains. At the present time we have about 57 miles of public water mains, and there are about 8,440 houses supplied with water, containing a population of about 50,000.

The following estimate shows the quantity of water used in various ways, and also the probable quantity of water wasted in an ordinary day's supply, at the rate of 2½ million gallons per day:—

	Galls.
Legitimate domestic supply	1,000,000
Flushing sewers	8,500
Water-carts	100,000
Public Urinals	5,000
Drinking-fountains	4,000
Lost and wasted	1,382,500
	2,500,000

N.B.—The public baths are not included in this estimate, as the principal water supply is taken direct from the wells, without passing the town.

* From Report on the Water Supply of Croydon, &c. By Mr. Baldwin Latham, C.E. (to Local Board of Health). Croydon: Ward, Printer. 1871.

With regard to the durability of various kinds of pipes, I have made experiments with lead, tin-lined lead, composition, block-tin, plain iron, Lavenant enamelled iron tube, enamelled iron, and galvanised iron tubes. For the purpose of these experiments a portion of soil was taken from a district in Croydon known to have an effect upon pipes when laid in it. A small quantity of the earth was placed in an earthenware jar, and two short lengths of pipes were buried in it, the action taking place in the soil through a long period being artificially produced by distilled water, containing a small percentage of nitric acid. After forty days' standing, the order in which the pipes stood the test was as follows:—Block-tin, lead, enamelled iron tube (Imperial Tube Co.'s, Birmingham), tin-lined lead, composition, Lavenant enamelled iron tube, plain iron tube, galvanised iron tube. The following table shows the loss of weight of each specimen during the period of trial:—

TABLE,

Showing the Durability of various Kinds of Pipe in prepared Earth.

Description.	Weight of Specimen before Treatment.	Weight of Specimen after Treatment.	Loss in Grains.	Duration of Experiment.
	Grains.	Grains.		Days.
Block Tin Pipe	944	944	Nil.	40
Block Tin Pipe	1,412	1,412	Nil.	40
Lead Pipe	4,125	4,125	Nil.	40
Lead Pipe	7,036	7,036	Nil.	40
Enamelled Iron Pipe	2,469	2,469	Nil.	40
Enamelled Iron Pipe (Imperial Tube Co., Birmingham.)	3,305	3,305	Nil.	40
Tinned-lined Lead Pipe	2,913	2,913	Nil.	40
Tinned-lined Lead Pipe	3,778	3,777	1	40
Composition Pipe	1,662	1,661	1	40
Composition Pipe	2,438	2,437½	½	40
Lavenant Enamelled Iron Pipe	2,096	2,094	2	40
Lavenant Enamelled Iron Pipe	3,092	3,091	1	40
Galvanised Iron Pipe	2,035	2,029	6	40
Galvanised Iron Pipe	3,428	3,420	8	40
Plain Iron Pipe	2,336	2,331	5	40
Plain Iron Pipe	3,261	3,257	4	40

From this table it will be seen that block-tin is the best material that can be used, but its great expense would preclude its general use; next in order stands lead; third, thickly enamelled iron tube; and last in the order of merit stand iron and galvanised iron tubes. The pipes were also submitted to further tests by being allowed to remain in prepared water for forty days, when the result was conclusively shown that the materials now used in Croydon, —viz., plain and galvanised iron tubes,—are the most destructible materials that can be used for the purpose. Under some circumstances strong objection may be raised to the use of lead pipes, on account of their being liable to lead to the poisoning of water. In my report of September 14th, 1869, I pointed out to you that lead, in the case of Croydon, was not liable to decay or to suffer from the action of the water.

The total expenditure up to the present time on the works amounts to about 75,000*l*. It will be seen from the following table that the water-works of Croydon, so far as the item of capital expended is concerned, will bear very favourable comparison with those of any other district having works of a similar character.

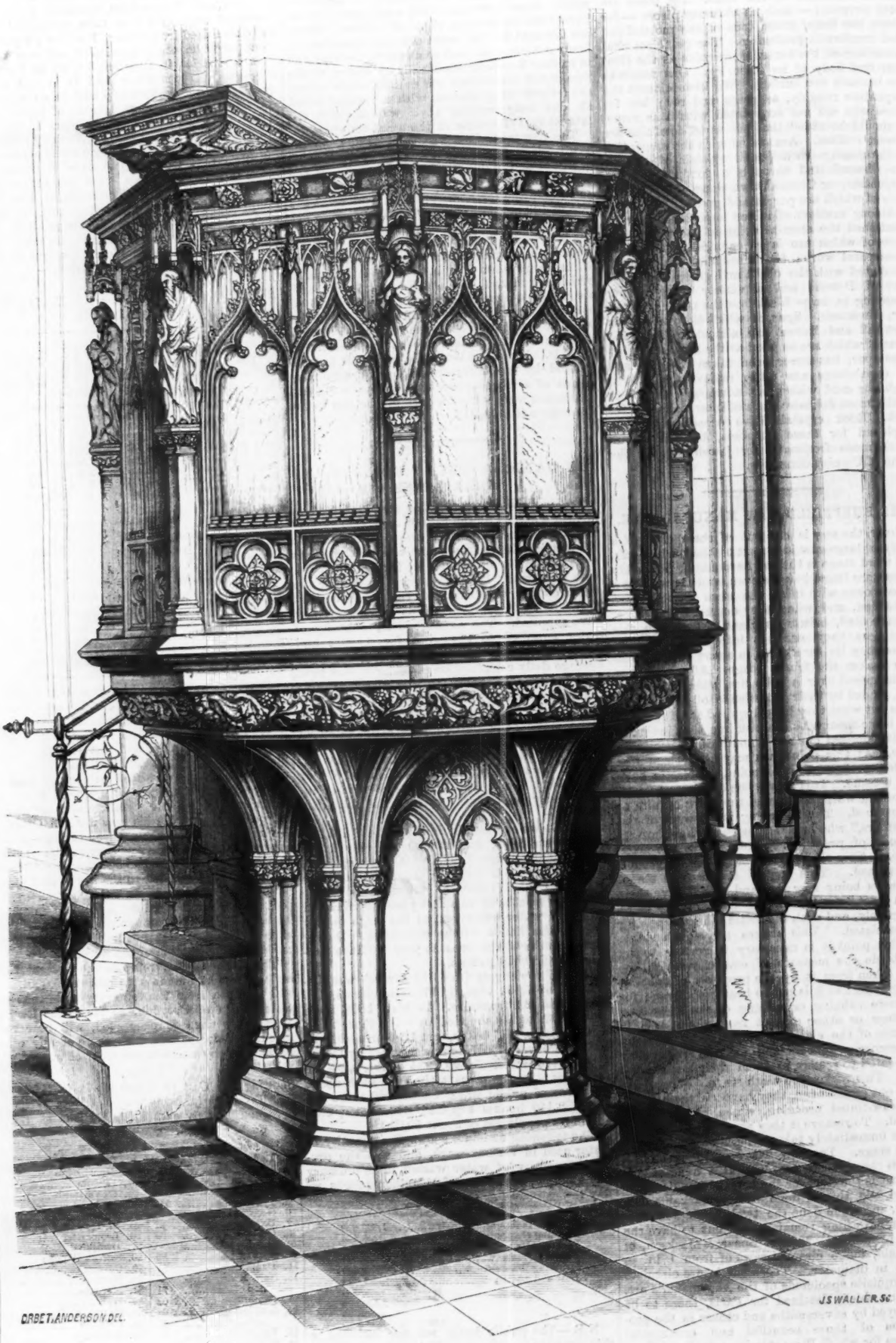
TABLE,

Showing the Cost of Water Works in thirty-five Towns, principally supplied from Wells by pumping, for each 1,000 *Gallons of Water daily supplied.*

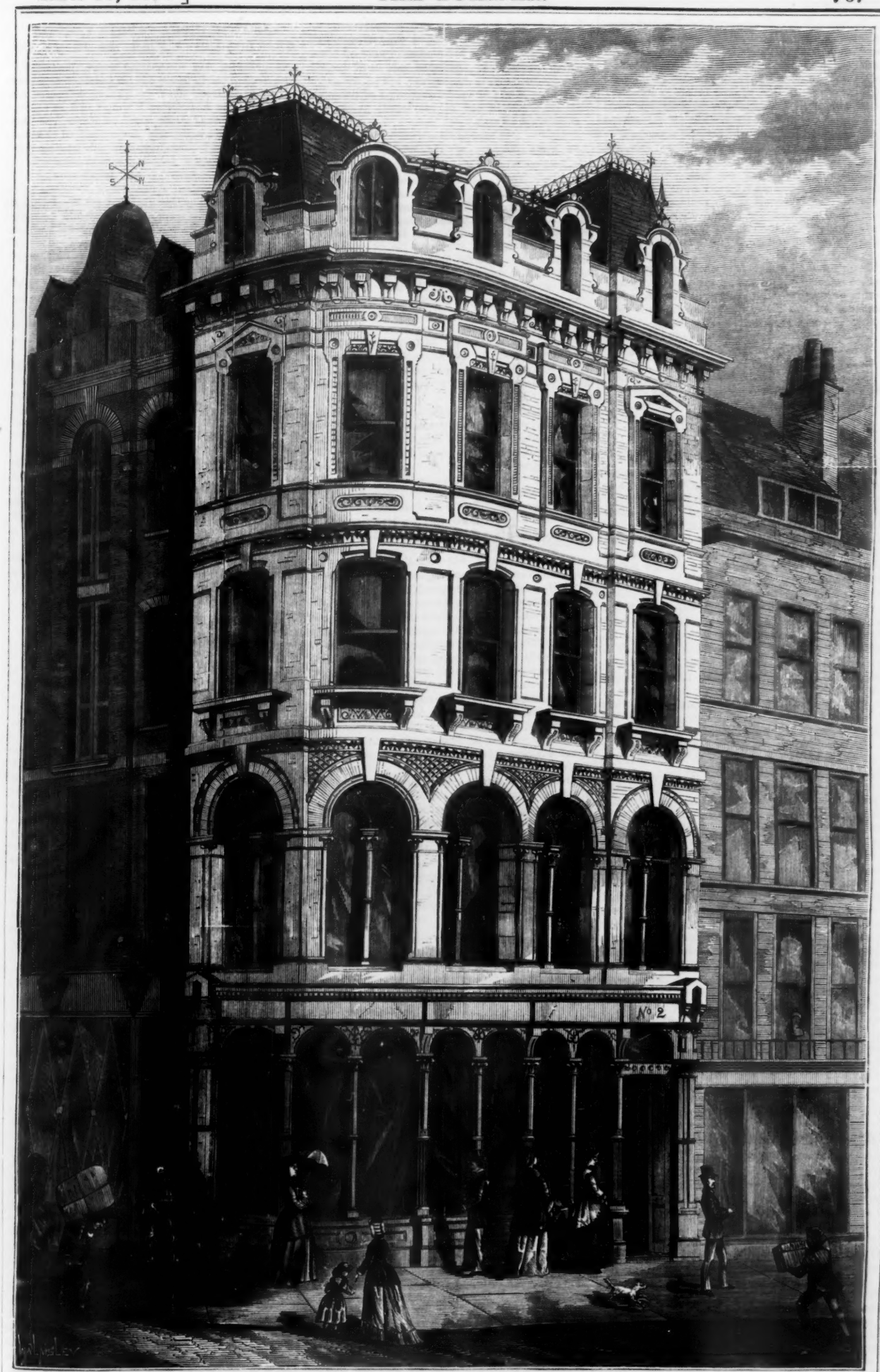
No.	Town.	£	No.	Town.	£
1.	Ryde	169	19.	Braintree	50
2.	Wolverhampton	125	20.	Stourbridge	48
3.	Liverpool	121	21.	Lincoln	47
4.	Tunbridge Wells	120	22.	Chelmsford	46
5.	Tynemouth	113	23.	Bridlington	45
6.	Gosport	94	24.	Enfield	40
7.	Uxbridge	91	25.	St. Helen's	40
8.	Guildford	90	26.	Leominster	40
9.	Hastings	80	27.	Ormskirk	40
10.	Rotherham	80	28.	Saffron Walden	40
11.	Deal	71	29.	Coventry	38
12.	New River, London	71	30.	Hartlepool	37
13.	Cambridge	62	31.	Margate	34
14.	Staffordshire Potteries	61	32.	Hull	30
15.	Brighton	61	33.	Exeter, St. Thomas	27
16.	Colchester	60	34.	Croydon	27
17.	Wallasey	55	35.	Salisbury	23
18.	Ventnor	53			

Average cost...£63·68

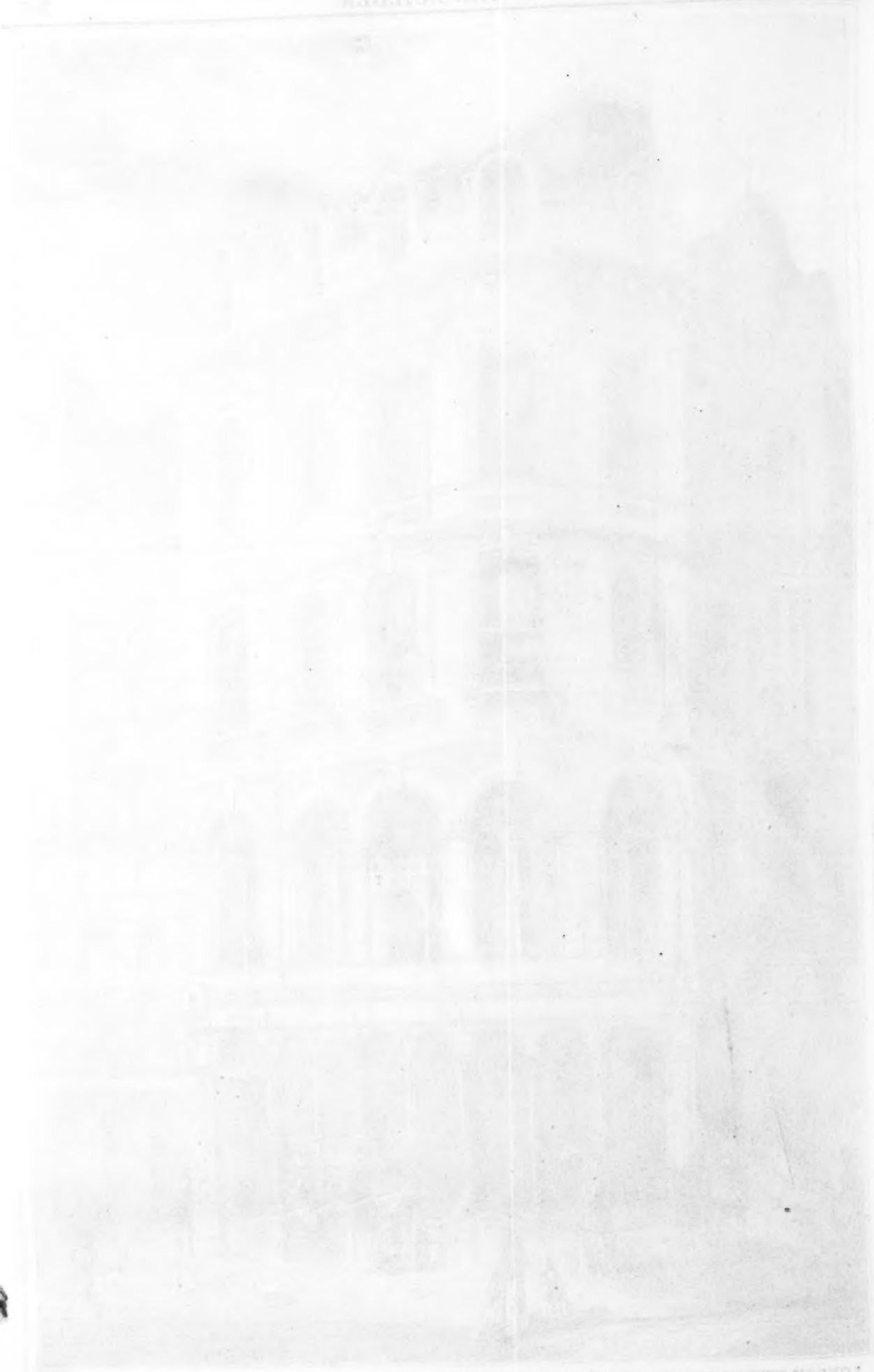
From an examination of this table it will be seen that with but one exception Croydon has had its water-works constructed at a less cost than any other works of a similar character.



ST. JOHN'S, CROYDON: THE PULPIT.



LONDON STREET ARCHITECTURE: HOUSE IN ST. PAUL'S CHURCHYARD.—MR. HENRY S. LEGG, ARCHITECT.



LONDON STREET ARCHITECTURE: HOUSE IN ST. PAUL'S CHURCHYARD.

OUR engraving represents the building now nearly completed on the piece of land that has, for some few years past, been boarded in at the corner of St. Paul's Churchyard and Ludgate-hill, and which no doubt many have thought was never to be built upon, but thrown into the public way as a public improvement. The great value of the land, however, which contains only about 312 ft. superficial, has no doubt influenced the City authorities, who have preferred to let it on a long lease for building rather than consult the general desire of keeping open the view of the noble west front of St. Paul's Cathedral, already too little seen from the only existing point of view, Ludgate-hill.

The site, which has the greater part of the front curved on plan, admits of one room only on each floor, with a staircase throughout. The ground and first floors are intended for shop and show-room, and hence the large quantity of plate-glass in those two floors.

The elevation is of Portland and Bath stone and white Suffolk bricks; the caps of piers and string-courses, also the whole of the upper cornice from the level of the top of the third-floor windows, being of stone, the rest of brick. The ground-floor front is to be of Spanish mahogany and ebony woods combined.

The building has a frontage of 35 ft. 6 in., with a depth of 12 ft. 6 in., and is carried up to a height of about 68 ft.

It is asserted that the original house on this site was Number *One*, London, the houses in former times having been numbered from this corner.

The architect is Mr. Henry S. Legg, and the work is being well carried out under his superintendence by Mr. Elkington, of Kingsland, builder.

THEATRES AND MUSIC-ROOMS.

SIR,—As supplementary to my remarks on the proper shape for music-rooms or lecture-rooms, allow me to suggest not only should they be constructed in the proper shape, but also as much as possible with materials of equal densities, in order that the air-waves may be reflected with equal velocities. It must be borne in mind that the reflection of the sound must interfere with the legitimate notes produced. Thus, suppose one sound to be carried along until it meets the walls of the room: it then is reflected back, and meets with, and will in some measure affect and alter, the sound or note which is following after it. This may be proved by singing close to a wall, and repeating the same notes close to an open window, when it will be found that the latter are much sweeter in tone than the former. This being the case, our object must be to ensure their reflection with equal velocities, and from equal distances, which can only be obtained by having the sound-emitting station in the middle of the hall, and the materials of that hall of equal densities. I should, therefore, construct the roof and floor of the same materials as the walls, and fill up the window or skylight openings with thick plate-glass or iron grating, enclosing small sheets of glass. Whether the Mediæval architects formed their roofs of stone, and filled up their windows with small pieces of glass enclosed in lead for the sake of getting a good and equal reflection for the notes of the choir, and the ease of the preacher in their churches, cannot, I suppose, be distinctly known; but any one who has visited a cathedral in the time during which service was being celebrated, cannot but have noticed that, whether sought after or not, this result has been obtained. The benches should be massive, or of stone or iron. I am also of opinion that the audience should be placed at some distance from the sound-emitting station point, so as to secure a surface on which the air-waves could impinge without obstruction. I should also leave a space between the audience and the walls, in order that the conflict of the outgoing and reflected waves of air should not be close to the ears. The plan of the building would thus resolve itself into an inner circle in (or over) which the orchestra or orchestra or rostrum would be placed; and then concentric ranges of seats for the audience, by which arrangement no one would face their neighbour as is now sometimes awkwardly the case; and beyond the seats and all round next the wall would be an open passage. It will be observed that this would also be the best plan for providing a free and equal egress for the audience in case a panic seized them, as there could be many doors, all of which would be equidistant from the benches. If desired a distinct entrance for the performers or lecturer, could be obtained by a passage under the hall, with staircase rising therefrom to the platform for their use.

ED. F. HUTCHINS.

The Prince's Theatre, Manchester.—Following closely in the steps of the late Mr. Charles Kean, even to the character of the "bill" and the publication of an annotated book, Mr. Charles Calvert has produced "The Merchant of Venice," with all the architectural, artistic, and antiquarian aid that he could make available, and, according to all accounts, has produced a remarkable picture of Venice in the sixteenth century. Mr. Rawdon Brown, Mr. Alfred Thompson, and Mr. Arthur Sullivan have co-operated; and Mr. Telbin, Mr. Telbin, jun., Mr. Hawes Craven, Mr. Hann, and others, have painted the scenery. *Shylock* is played by Mr. Calvert himself. The house has been improved under the direction of Mr. Alfred Darbyshire, architect, and decorated by Mr. Geo. Gordon. We shall be tempted to make a descent on Manchester.

Theatrical Machinery.—The *Gazette des Architectes* (No. 19, seventh year), just now published, contains the conclusion of an elaborate essay on "Theatrical Machinery, with reference to the New Opera House," by M. Quéruel, engineer.

Belfast.—On Monday night last the New Theatre Royal, Belfast, which has been erected at a cost of upwards of 13,000l., was opened. At the conclusion of the comedy, "Time works Wonders," Mr. J. F. Warden, who, on appearing before the curtain, was loudly cheered, delivered the opening address. Mr. M'Keown, the contractor, was then called for, and loudly cheered.

Hydraulic Machinery for the Stage.—We are informed by *Engineering* of the successful application of hydraulic machinery to all the purposes of the theatrical stage. M. Quéruel has recently established his apparatus at the Gaîté Theatre, Paris. The water is taken from the City mains, under a pressure of three atmospheres. The accumulator is formed by the barrel of an hydraulic pump. The piston speed is a little more than 3 ft. per second. This power is transmitted to the objects to be moved by four-fold tackle, which reduces the power to one-fourth, while quadrupling the speed. By this means a large power, with a velocity of 13 ft. per second, is obtained, transferable by pulleys to all parts of the stage where it may be useful. A single attendant can regulate the machinery, move the scenes, raise or lower the curtain, or move carriages or other objects on the stage.

The Pavilion Theatre, Whitechapel, has been altered and decorated so as to be nearly a new house, under the direction of Mr. J. T. Robinson, architect. Messrs. Pashley, Newton, & Co., executed the decorations, and Mr. J. H. Watson built the new stage.

STRIKES.

SURELY the disastrous contest in Newcastle has now taken such a shape that the workmen should arrange to settle it. The difference is very small, and the masters have yielded much more than the men are asked to yield. Sir William Armstrong says:—

"The only effect of the reduction of hours at Sunderland has been to cause the higher rate for overtime to commence one hour earlier than before, and the actual duration of each day's work remains at least as great as ever. As a comment upon this statement it has been said that the practical result of conceding the nine hours at Sunderland proves that the apprehension of the masters in regard to their plant being laid idle for an hour in the day is visionary. In reply, I say that, if the League are contending merely for higher wages in the form of longer overtime, why did they not shape their claim accordingly? Their doing so would have removed much difficulty. The actual form of their demand justifies us in assuming that they have the ulterior design of calling upon the men to refuse overtime, which would have the effect of paralysing the capital of the employer during the periods of enforced idleness.

Let it be recollected, he continues, that the masters have already conceded two-fifths of the full demand made by the men for reduction of time, and that the question is now narrowed to three hours instead of five per week. Would it not be more rational and business-like on the part of the men if, instead of abusing the employers for resisting coercion, and resorting to the only expedient open to them for carrying on their trade, they were to accept the concession which has been made of nearly half their demand in time, and seek an arrangement in wages as an equivalent for the remainder?"

Enormous mischief is being done by the continuance of the struggle. Who shall tell the amount of privation and demoralisation it is producing? And we must confess we regard with deep sorrow the introduction of large bodies of foreign workmen to supersede our own people. Still, we cannot blame the masters, in the face of the unyielding determination to have their way in their own way that has been shown by the men.

The works, it is stated, are half-full already. The new hands are bound for six months, so that if the old workmen were even willing to return now, the services of all could not be accepted. 6,595 lads and men originally struck; 3,116 are now in the shops.

Many of the old hands have found work elsewhere. The number of men to be relieved is 1,986, and number of children 2,534.

Both sides might now well agree to leave the question to the unconditional arbitration of some well-known public man.

Mr. John S. Storr, writing on "Work and Wages," in the *Beehive*, says,—"It is exceptional now-a-days to meet with either a master or a workman who throws into his labour a true artistic spirit and feeling, without which work is mere slop mechanism—uninteresting to the man who toils, worthless to him who buys the product of the toil. I speak not of the building trades alone; half a dozen other trades, with the details of which I am even better acquainted, are in the same unhealthy state. No pains are taken with the technical education of apprentices; the old hands set a bad example; the effort is neither to do as much work as possible in the hour, nor to do it with the best finish possible, but the reverse. 'Let us get to the day's end with as little effort and perspiration as we can, and let us slouch through the work anyhow.' I say, *this is sad*, and can lead, in the long run, to nothing but destruction—a destruction extending from the work to the worker, and undermining the whole moral nature of our people. It was in a far other spirit that Cimabue, and Giotto, and Raffaelle painted their immortal works; that Benvenuto Cellini and Michelangelo made cold marble and dull metals breathe with life; that Paul preached and Arnold (of Rugby) taught; that Wellington and Nelson pondered, and then went forth *to do their duty*.

This contamination of spirit and deterioration of work, though very widespread, have hitherto affected the operatives of the north of Europe far less than those of our own countrymen. I have, within the last week, compared the joiners' work on a large building here,—erected by a first-class London firm of builders, under an experienced architect's supervision, and paid for at full rates in ready money,—with some Swedish work of the same class; if any of your readers wish it, they shall see both on applying to me, and make their report to you; the difference is as great as between an old Gillow or Chippendale sideboard and one met with in the New-cut. The London architect, builder, and joiner would, if judged by court-martial, be sentenced to I know not how many lashes each, and they would richly deserve all they got."

THE CITY PAROCHIAL ENDOWMENTS.

THE new Educational law is naturally turning attention to the way in which more or less ancient educational endowments are managed, and the funds disposed of; and it is to be hoped that the issue will be a decided amendment in many respects. Even the vast revenues of Christ's Hospital may have an overhauling. It was founded by King Edward VI. in 1553, "for the education and maintenance of fatherless and helpless children."

An important paper was read not long ago by Sir Charles Trevelyan at the Social Science Association, "On the City Parochial Endowments," and it appears in a printed form in the Sessional Proceedings of the Association, dated July 13th. In the course of the paper Sir Charles says:—

"I will not repeat the painful story of the manner in which these important public revenues

are muddled away. The rich ecclesiastical endowments in the City are positively damaging to religion, because they are bestowed upon shepherds without flocks, and the House of God is turned into a Temple of Mammon, where a weekly mockery of spiritual teaching is gone through for the sake of the emoluments. The least objectionable appropriation of the civil endowments is in paying the church and poor-rates (including the police and other cesses) of the richest class of proprietors in England, the owners of the City counting-houses and warehouses. A great deal goes in feasting and holiday-making under pretence of 'audit dinners' and 'inspections' of the different properties by large numbers of persons, and a great deal more in the luxurious adornment of churches from which the congregations have disappeared."

"The surplus of the Charitable Trusts Fund was to be applied 'to the extension and improvement of education within the metropolis, and to the promotion, by such means as the Commissioners may judge best, of the well-being of the poorer inhabitants of the metropolis.' . . . It is neither reasonable nor just that the present generation, which has so many claims upon it, should be harassed by repeated appeals to give to objects which have been already amply provided for by the piety of their ancestors. While, notwithstanding the most strenuous efforts, only 389,000*l.* of the million required to relieve the spiritual destitution of the outer circles of the metropolis have been raised, at least two millions are lying at waste and abuse to the scandal of the Church in her ancient stronghold of the inner circle of the City of London. The case is equally clear in regard to the lay endowments. It is preposterous that additional taxes should be levied from ratepayers, many of whom have a hard struggle to maintain their independence, while ample funds already exist for the selfsame objects, which were provided by the benevolent foresight of our ancestors, but are withheld for various interested purposes by persons who have neither inherited nor earned them."

"Of all the modes by which the lower population of London can be elevated and improved, the first and most essential is education, and this lever has now been applied in a systematic and efficient manner through the medium of the Elementary Education Act and the London School Board. The 'City of London Charitable Trusts Fund' would supply the weight required to set this lever in motion. Its distinguishing feature is that it represents a great mass of dormant capital; and it would, therefore, be in an especial manner applicable to the *outfit* of our London educational system. Schools will have to be erected on a scale suited to the comprehensive plan of the School Board, with masters' and mistresses' houses and play and drill grounds annexed, and one of the greatest difficulties is the excessive cost of sites in London. Then the keystone of the system will be wanting if secondary schools are not established in suitable situations, throughout London and its environs, for the education of the lower middle class, as well as of scholars of more than average merit from the elementary schools; and technical instruction worthy of a country which claims the foremost place in mercantile and manufacturing industry, ought to be provided in these schools."

In conclusion, Sir Charles says:—"If we desire to strengthen the foundations of our existing state of society, no surer way is open to us than by sale of the lands, houses, &c., of these endowments, and investiture of the proceeds in the funds, to convert corporate into private property; and, of all the various classes of corporate property, none is better calculated to take a firm hold upon the masses than these City parochial endowments, because they represent every variety of holding, such as houses, cottages, stables, gardens, workshops, warehouses, wharfs, and country farms, which, separately sold, would pass into a multitude of hands, and tens of thousands of our people, belonging to various social grades, would share in the interests and feelings of proprietors."

New Tunnel Project.—Mr. Charles Richardson, C.E., of Bristol, has laid before the Cardiff Chamber of Commerce a scheme for shortening the railway communication between South Wales and London by tunnelling the Severn near Portskewitt, and joining the Pilning Station to the Bristol side of the river. The cost of the tunnel is estimated at 535,560*l.*, and it is calculated to take five years in construction.

A WORKMAN'S MUSINGS ON THE NINE HOURS STRIKE.*

SIR,—For the last three or four years many people in this country have been blessing themselves with the idea that industrial strife had ceased, and that from henceforth industry had, in arbitration boards, found a better plan to settle its differences than by going to war. Now that delusion is vanished, and one sees and hears nothing else but wars and rumours of war. Any one who is in the habit of preserving, or, as it is called, filing the newspapers, and sometimes, for amusement or instruction, turning them over, must be surprised at the extraordinary things they unfold. Strikes and lock-outs seem to be of the nature of epidemics, and appear to follow or precede them with great regularity. Any one turning over, for example, the pages of the *Builder* for 1865-6, will find precautions to be taken against the cholera, and in the labour column an account of the advance of wages movement. The country was at that time agitated from "Land's End to John o' Groats," and the workmen, as a rule, obtained a large advance on previous rates. Everything went on swimmingly for a time; the tide was smooth, and scarcely a wave rippled the industrial ocean. Men built on the prosperity, as though the foundations were solidly laid. But in a very short time the storm came and shattered their hopes, and it was soon found the workmen had built upon the sand, and a very small storm knocked down such fragile buildings. Before the crash the workmen's friends and advisers were exultingly jovial. Figures were week by week put forth to show the cost of the strikes to the workmen and the gains that would result to them by their successes. Since that time the working men's friends and confidential advisers have had to raise another cry, and the trade society funds told a tale quite the opposite to the one they had previously sung. The Engineers' Society's funds were reduced 100,000*l.*, and the Ironfounders' Society told the same tale, until it began to be the talk that the society would have to dissolve. Charges of mismanagement were made against the officers, and the society was saved by the men in work increasing their subscriptions.

Instead of advance of wages, the cry was,—Depression of trade, want of employment, emigration, reciprocity, and protection. And in spite of all the bombast of the workmen's leaders, it was found they were powerless, and could not bring about a revival of either home or foreign trade. Both in and out of Parliament the cry was increase of pauperism,—Government employment. Every nostrum-monger ventilated his hobby. Government aid was sought to remove the people to other countries; and the Executive, or managing part of the nation, was soundly rated for the small interest shown in the continued distresses of the people.

During the past twelve months trade has been reviving: employment, if not plentiful, has been very near sufficient to employ the people. The emigration cry is grown less and less, and now is almost forgotten; and once more the papers are teeming with reports of workmen's agitations. And because the employers have not in every case given what the workmen required, they are, according to working-class papers, a greedy, selfish, tyrannical lot of capitalist despots; while, on the other hand, the workmen's leaders' demands are always right and just. The true state of the case is rarely, if ever, put before the working classes in the papers they read. The ignorant and the foolish are led astray by the mis-statements and false light in which the case is put, and in nine cases out of ten the workmen find out when it is too late the false path in which they have been dragged.

Strange it is, the great injury which trade societies inflict upon the workmen is, that they keep trade in a continual agitation. It appears that the officials think there is no peace but in war. If an employer was allowed to carry on his business for several years without their interference, they would require a premium for their lenity. What use are trade societies, if they have funds lying useless, and cannot be applied to the purposes of war? It is obvious that the English trade cannot be continually at war without damaging the belligerents; and it is evident that if England, and England's workmen, are to continue to trade with the whole world, the aggressiveness must cease; for what can be more injurious to an employer than to be always in fear of a stoppage of his business? He cannot with any certainty enter into engagements. It is like a bankruptcy always staring him in the face, and is damaging the interests of both parties. There is not the least doubt but that the doctrine of political economy has, on the whole, been most injurious to both employer and employed. Men talk of it as though they understood its every part. Of course, there is in the works of Adam Smith, and in all the writings of the economical school, much that is correct and applicable to commerce and society; but it is evident to any one who has studied these writings that they will never regenerate society. The fallacies in them are so apparent to the most casual observer, that they only want showing to be patent to the many, and that the science so-called has its limits, or, at least, many modifications. For a long time the workmen were told there was so much capital applicable to the wages fund, and that the price of labour was regulated by the supply and demand. The principal object of trade societies is to regulate the hours of labour, and get an advance of wages. The leaders of these societies have made the doctrine of "supply and demand; buy in the cheapest, sell in the dearest, market." Their capital, their fertile brains, are always in action. Of course, it is for the benefit of the working classes, or, at least, that section which they chance to represent. Business is business; and, of course, the unionist leaders, like all other business men, must try and keep their projects prosperous. They forget that every class advance is paid for by the general public. It is not the rich who buy all the produce of the labour of the working classes. Every advance of the necessaries of life affects all classes; and if the engineers or any other section get more than their share, it is a tax upon the other workmen, and the agitation is carried on until all get an advance; and when that is done, of what benefit is it to the whole? Everything is higher in price, and the people get no more of the productive share than they did before. The cost of production is increased, and a larger opening is made for the foreign employer to compete with the labour of this country,—"Buy in the cheapest, sell in the dearest market;" and that the price of labour is regulated by the supply and demand, is the doctrine which has for a long time injured the trade and general interests of this country. It has supplied the trade-union leaders with the materials to carry on their agitation. If it was true, the wages of workmen ought to have been largely reduced during the late depression of trade, as there were thousands of unemployed; but the workmen's wages remained the same. And so it was with the engineers, the ironfounders, and in fact with all trades. The wages of the labourer are not regulated by the plentifulness of the workmen, but by the price the article they produce will fetch in the market. It being so, the supply and demand idea relative to labour wants to be got rid of, and a sounder and more practical issue put in its place. One thing is certain, that gold, of the same purity, is all over the world of the same value. Now if a given number of ounces of gold be required to produce an engine; and if, when finished, that engine cost so much more than one of the same quality costs in another country, the workmen of this country ought to make an inquiry into the cause. As a large part of the productions of this country has to be exported, it is obvious the workmen of this country must produce a cheaper and better article than can be produced in other countries.

Workmen and their leaders ought by this time to know, that in the industrial race the manufacturers are already closely run. In iron and cotton producing countries, the people are beginning to work the raw material. Any reader of the *Times* or the statistical abstract can see for himself the steady advance in exports which a few years ago were peculiar to England. Writers in the so-called "people's paper" may ridicule the idea that other countries are making any advance in competition with England. But it is a fact which no one can deny, that some engines and other goods have been imported into this country at a much cheaper rate than English manufacturers can produce them.

As but few manufacturers export the goods they produce, the commercial part of the trade is carried on by other parties called merchants. They are, in the strictest sense, internationalists. It matters none to them whose goods they sell,

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* It is desirable it should be understood that this heading is strictly correct.—ED.

so as they make a profit; and, if they can buy goods in a foreign country cheaper than the English employer can supply the same quality goods, the merchant buys: he has no sentimental ideas about patriotism, or paying a higher price for the articles because his country produces them. This country labours under many disadvantages in comparison with other countries—high taxation, high wages, drinking customs; and, to hear men talk, it would appear that the employers lived in clover, had no thought or cares, and had nothing to do but run and win.

Our leaders say that, in spite of all difficulties, employers make large profits, and amass large fortunes. To some extent that is true; but the annals of the Bankruptcy Court show that many employers do not amass, but, after sometimes paying millions of pounds in wages, die poor. During the week, a noted leader of the working men—or, at least, some portion of them—a shoe-seller—once a shoemaker—now an agitator—has been talking to a number of workmen about the large profits and fortunes employers make. Any one taking the census-table for a basis will find there is a large number of employers in this country who only employ a man and a boy: no one ever heard of such employers leaving a large fortune. There are many small shoe-sellers. Suppose a shoe-salesman sell during the year 999 pairs of shoes at a profit of 9d. per pair; that would give an income of 37*l.* 9*s.* 3*d.* At that rate of sale and profit, the aggrieved shoe-seller would not amass a very great fortune. I suspect the shoe-seller buys his shoes in the cheapest place, without asking whether the workmen are ill or well paid. He, as a trader, is obliged to sell as cheap as his fellow tradesmen, or it is certain the public will not buy his shoes.

If the trader could enlarge his business so that he could sell 999 pairs of shoes in the day, and reckon 312 working days in the year, he would make a profit of 11,594*l.* 14*s.* Out of that amount he would probably save 2,000*l.* a year; and if he happened to do that for thirty years, he would, with the interest, have accumulated 100,000*l.* No doubt the speaker thought he had made a great point when he alluded to the employer worth 7,000,000*l.* It appears to me if there is one thing more than another that Englishmen ought to be proud of, it is, that one of the great employers, or shall we say generals of labour, accumulated that large sum.

In St. Paul's Cathedral and Westminster Abbey are many monuments to kings, statesmen, and generals, some of whom received enormous sums from the national exchequer. But the labours of the great general of industry, the pioneer of a higher civilisation, the benefactor of nations, received no national recognition, and no national award.

What a noise has been made about the sham battles which have lately been held. By the reports in the papers some would have supposed this country was at war. What a fuss was made of the moving and exercising 30,000 men; and yet at one time it is said that the general of labour employed 50,000 men. If the weekly wages for that number averaged 1*l.* per man per week it would have been 50,000*l.*, and the sum paid for wages alone during the year would have been 2,600,000*l.* If the plant and materials required to keep that number employed amounted to another 1,500,000*l.*, it would have required a capital of 4,100,000*l.* If that sum had been put out at 5 per cent. interest, it would, without any risk or trouble, have realised the enormous sum of 205,000*l.* per annum. If the employer of 50,000 men received a shilling per week for the management of a workman, it would amount to 130,000*l.* per annum. As no employer undertakes the management of men at that price, the above sum might be put at double that amount, and then be below the mark. And without any wonderment or remarks, it must be evident that great generals of labour, by the magnitude of their undertakings, may accumulate, if wise, large fortunes. It requires an immense fortune to carry their work on. Were all employers in this country like the one with a man and a boy, nobody would accumulate large sums, no capital would be created. Yet competition would be more severe than it now is, and the labourers would be most miserable. The large employers of labour receive no more profit than they are entitled to. In my opinion, they are an honour to their country, and an advantage to the whole community. If working-class leaders cannot find better reasons for their agitations, it may well be said of them, "*Ne sutor ultra crepidam.*"

The engineering trade, although well organised, is not one of the very great industries of the country. The number of engine and machine makers, and dealers, was 60,812, according to the census returns for 1861. But, as a rule, they work in large establishments. The 6,595 men that struck work at Newcastle worked fifty-nine hours per week. That, in the aggregate, would be 389,105 hours per week; that, at 7d. per hour, would amount to 11,338*l.* 17*s.* 11*d.*; reduce the working hours to fifty-four per week; it reduces the working time to 356,140; and to turn out the same amount of work, it requires the employment of 641 extra men, and adds 914*l.* 7*s.* 11*d.* to the employers' funds for wages, and for the year an additional outlay for the same amount of work of 47,348*l.* 16*s.*, which, with the extra machinery and work-room required, brings the cost to nearly 100,000*l.* If the whole number of workers in the engineering trade is 58,000, leaving the 2,862 for casualties and want of employment, and, as there appear to be variations in the time they work, fifty-seven hours per week per man may be taken as the working time,—that will give 3,306,000 hours as the aggregate for the week; at 7d. per hour, the sum paid for wages will be 99,300*l.*, and for the year a sum of 5,178,000*l.*: reduce the working hours to fifty-two, which will be the number if the nine-hour movement is successful, it reduces the working time to 3,016,000, and requires the engineering employers to add 3,881 men to do the same work as before, at an additional outlay of 845*l.* 8*s.* per week, and for the year a sum of 439,716*l.*: that, with the cost of extras, will amount to nearly a million.

In the reports of the Paris International Exhibition it states that if the foreign trade in machinery were closed, many of the employers would have to close their yards; and it is probable that if the cost of production be raised a million a year that will happen, and instead of the nine hours per day it will in many cases be none at all.

The action of the men who guide the working classes, who manipulate their movements, who lead the thoughtless astray to their own and the nation's loss, is pernicious in the extreme. Some other teachers are wanted to place the truth before them,—to show both sides,—and until that is done these movements, so fatal to national well-being, will continue. English working-men are placed in a false position before the world, and are driving from themselves their daily bread. There are many other points I intended to touch upon, but I find I have not space, and will, with your permission, do it in another letter.

JACK PLANE.

PLANNING AND FITTING UP SCHOOLS.

THE Committee of Council on Education have made a number of rules to be observed in planning and fitting up schools, which have been recently issued by the Queen's printers, preceded with some remarks on the subject. The document contains a number of rules, and the plans of the schools are exhibited. In the preliminary remarks it is stated:—"Before a school-room is planned—and the observation applies equally to alterations in the internal fittings of an existing school-room—the number of children who are likely to occupy it, the number of classes into which they ought to be grouped, whether the school should be 'mixed,' or the boys and girls taught in different rooms, are points that require to be carefully considered and determined in order that the arrangements of the school may be designed accordingly. Every class when in operation requires a separate teacher, be he only a monitor acting for the hour. Without some such provision it is impossible to keep all the children in a school actively employed in the same time. The apprenticeship of pupil teachers, therefore, is merely an improved method of meeting what is, under any circumstances, a necessity of the case; and where such assistants are maintained at the public expense, it becomes of increased importance to furnish them with all the mechanical appliances that have been found by experience to be best calculated to give effect to their services." After stating that the common schoolroom should be planned and fitted to realise the combined advantages of isolation and superintendence without destroying its use for such purposes as may require a large apartment, the Committee of Council do not recommend that the benches and desks should be immovably fixed to the floor of any school, but be so constructed as to be easily removed and not to be easily pushed out of place by accident or by the movements of children. The master of a school should never be allowed to organise it so as to provide for carrying out the entire business of instruction without his own direct intervention in giving lessons. "He must, indeed, at times leave himself at liberty to observe the manner in which his assistants or apprentices teach, and to watch the collective working of his school." The remarks the Committee consider will explain the plans as regards the arrangement of the buildings, and the internal fittings of schools and class-rooms.

SANITARY PROGRESS.

NOTWITHSTANDING all the bad names Truro and Falmouth gave "Pro," we notice that from the time his paper appeared in the *Builder*, progress has been made in sanitary matters in those towns.

In Falmouth the sewerage of the town is in progress. In Truro, from a paragraph in the *Royal Cornwall Gazette*, we see the "Town Council is spending about 20*l.* a week in cleansing the Truro river," while other sanitary matters are receiving much attention. We are very glad our papers have, after all, been taken in good part.

And in Glastonbury, sewering the neglected parts of the town is in progress; and a Local Board of Health has been established. Though appointing officers at ridiculously small salaries we esteem bad policy, yet we cannot expect everything all at once. With experience, we trust the Local Board at Glastonbury will see its faults.

INCOMPLETE LIST OF TENDERS.

SIR,—May I so far intrude upon your valuable space as to beg the insertion of the following facts? In your last week's copy you gave the names of and the amounts given by five contracting engineers, who estimated and sent in their tenders for the works at the "Holborn Union, St. Luke's Workhouse," and I note that in doing this the two highest estimates have been omitted. There were, in fact, seven tenders opened, and the firm which in the published list was the highest is really the third. In my opinion, no details of these matters should be given unless they are given correctly. No doubt there will be at times omissions and errors; but in justice to the professions and trades concerned, these should be explained and corrected.

The published list of competitors was as follows:—

Jeakes & Co.	£1,028	3	3
Elliott	990	0	0
Benham & Son	810	0	0
Potter	740	0	0
May	690	0	0

The *true* list of competitors is as follows:—

Hart & Co.	£1,365	16	0
Moreland & Son	1,331	0	0
Jeakes & Co.	1,028	3	3
Elliott	990	0	0
Benham & Son	810	0	0
Potter	740	0	0
May	690	0	0

ESTIMATING CLERK.

*** The list published by us was official.

INSURANCE FOR THE CLERGY.

THE Rev. Jas. Lupton writes,—

You have admitted into your columns letters relative to ecclesiastical dilapidations, but one thought seems to have escaped the writers,—viz., whether the Bounty Board should not at once take up the business of fire insurance, so far as the clergy are concerned. I am, and I make no doubt my clerical brethren are also, deluged with prospectuses of fire insurance companies. These companies are putting forward their separate claims, all, no doubt, expecting to receive some profit. The insurance is to be effected, not only in the name of the incumbent, but in that of the governors of the Bounty also. Indeed, the governors are mixed up with this business in various ways. Why not at once constitute the Bounty Board into a fire insurance office, so that whatever gain may accrue it may go to the augmentation of small benefices?

HOW WE SPELL POMPEI.

SIR,—Will you be good enough to say in a little note that however Pompei, with two *i*'s may be the orthodox orthography of the press, it is not my orthography. The Italians write the word with one *i*, and so do I invariably. Two *i*'s seem to me to be pedantic.

H. C. BARLOW.

VENTILATION OF COAL MINES.

SIR,—Soon after the explosion at the Wigan collieries, I went to the Royal Geological Museum, Jermyn-street, to see the newest method and appliances used to ventilate coal mines. I was pleased to observe the rotary blast fan is used at two collieries (I hope at many others also); but the air requires concentrating and conveying through gutta-percha or metallic pipes to the far-off workings, with stop-cocks midway, to rush and flush aidings, &c., when needed.

The immense power of these fans can be seen at all smelting works. Mines could be freed from explosive gases by an unlimited force of air night and day. Its return through the mine to the shaft would clear the pit of gas.

. . . . If there's a will,
There are men and material for every ill.

R. T.

UTILISATION OF SEWAGE.

THE West Ham Local Board of Health have just completed an arrangement to purchase, subject to the sanction of the local Government Board, four contiguous farms, containing 750 acres, in the parishes of Barking and Dagenham, adjoining the river Thames, for the purpose of utilising the sewage of the West Ham district. The sewage will be delivered by steam power through about six miles of main culvert. The arrangements and works are under the direction of Mr. Lewis Angell, the engineer to the West Ham Board.

THE DUCHESS OF SUTHERLAND'S MONUMENT.

SIR,—I do not like to see fine quotations marred and spoiled, especially when indelibly engraved on brass or marble in such a noble and well-deserved monument as that to the late Duchess of Sutherland, on the panels of which, you state, are certain texts; amongst others, the following misquoted one:—

"And there shall be no more death, neither sorrow nor crying, neither shall there be any more pain; *and sorrow and sighing shall flee away.*"

The words in italics are interpolated, and meaningless tautology, both words and sentiment having been used before. The writer certainly was not inspired, like St. John, whose text is as follows (Rev. xxi.):—

"And God shall wipe away all tears from their eyes; and there shall be no more death, neither sorrow, nor crying, neither shall there be any more pain: *for the former things are passed away.*"

How simple and grand is the true text, and how obvious the meaning of the last expression.

HENRY BAKER.

ROADS IN PARIS.

WE are informed that some of the Paris roads are being broken up, and that the authorities are about to revert to paving-stones, as of old. The cost of keeping up what our informant terms "Macadam," but by which we suppose he means the asphalte concrete with which the principal roads there are laid, is given as the reason for the change.

MANSION HOUSE BUILDINGS.

SIR,—Owing to absence from town, we did not observe a letter in your issue of the 16th inst., wherein your correspondent takes exception to the shop-fronts at the above new buildings. "S. F." is mistaken in supposing that these shop-fronts, of which he most justly complains, were designed by us, although the "description" of the building to which he refers would alone warrant such a conclusion; for we are confident that such "incongruous" work, and such bad detail, could not be attributed to an *architect*, but only to *shop-front fitters!*

J. & J. BELCHER.

P.S.—Mr. Deroy's front, which was excepted by "S. F." was carried out from our designs and under our superintendence.

THE TRADES MOVEMENT.

Nottingham.—The operative joiners have held a meeting. It appears that they had bound themselves, having accepted certain conditions, to the masters for a certain time, as to the prices to be given for their labour. The result was a great influx of labour from other towns. The workmen not only felt themselves aggrieved by this influx, but, still wishing honourably to abide by their agreement, they found it impracticable, notwithstanding the requirements of the trade, under the circumstances, to ask for an advance of wages. The great demand being at present for house work, a higher rate of remuneration was felt to be due to the operative joiners; and the present conference was held to discuss their position with reference to the whole matter. After a long deliberation, it was resolved to leave the matter open pending the decision of the court of arbitration.

Manchester.—Some 640 masons are employed in the building of the Manchester Townhall. An under-foreman having discharged one of the masons for insubordination, the other men at once waited upon the head-foreman, and demanded the discharge of the under-foreman. The head-foreman requested time to inquire into the facts of the case; and, as he would not give a decision at once, the men struck, and the whole 640 left the place, but they have returned to their work without any concession having been made to them. The reason of their return is supposed to be that their own society would not recognise their strike.

Barnsley.—A conference of master builders and the representatives of the bricklayers on strike has been held at the Coach and Horses Hotel. Nearly all the firms in the town were represented. After some discussion, the masters informed the delegates present that they could not accept less than three months' notice, and that any change in the working hours, &c., must take place from the 1st of May, according to an agreement entered into some time ago. The strike has had the effect of stopping the erection of the new Lancashire and Yorkshire railway station, and other buildings.

Glasgow.—At a meeting of the Clyde Engineers' Association, held at Glasgow, it has been resolved, taking into consideration that the carpenters' strike continued in the Glasgow district, notwithstanding the advance of wages offered at Greenock and other places at which they work, "That a lock-out of all the carpenters of the Clyde should take place unless the strike was brought to an end."

TILE MANUFACTURERS.

SIR,—We are much surprised to observe, from your issue of the 16th inst., that you describe certain matters of tiling as having been carried out by a firm of "Minton, Taylor, & Co." As Sir R. Malins remarked, in a recent trial before him in Chancery, such a title is most certainly calculated to lead the public to suppose that the above is a firm of *Minton & Co.*, whereas, that to which it alludes really is simply and honestly *Messrs. Taylor & Challinor.*

The *order* which Sir R. Malins made, however, was, that this new firm should trade exclusively under the title of Mr. Taylor's *own name*:—"Robert Minton Taylor, Tile Works, Fenton, near Stoke-upon-Trent."

We must request, therefore, to be informed how such an error occurred in your paper; and we further beg to intimate that, in the event of such mis-statements appearing in future, we really shall be compelled to take proceedings against you. MINTON, HOLLINS, & Co.

P.S.—We send you a circular per this post in reference to the Chancery trial to which we allude above.

*** In our last issue we printed a communication from the firm referred to, setting the matter right, and, to make the point clearer, we willingly insert Messrs. Minton & Co.'s letter, notwithstanding the nonsensical threat to take proceedings against us if the comma too much should be inserted. The legitimate representatives of our old acquaintance and an eminent man, the late Herbert Minton, it is not likely they will be willingly damaged by us. They must remember, however, that the world is not so fully taken up with the doings of themselves and their competitors as to remember precisely how the names stand; and if they wish others to be particular, as very rightly they do, they must be particular themselves. To illustrate what we mean,—if it had not been for a printed heading to the letter from them we have inserted, we must have printed the signature Minton Hollins & Co., with the belief that Minton was the Christian name, the two names being joined one to the other without the slightest mark to show that they represent more than one person.

THE PERILS OF RAILWAY PLATFORMS.

DR. LANKESTER has held an inquest at the University Hospital, Gower-street, respecting the death of Geo. William Lane. Deceased was in a train on the Midland Railway: at the Kentish-town Station the train stopped, and Lane opened the door and got out, when the train started again and then stopped, throwing Lane out and under the carriage, where he was fatally injured. The coroner, after evidence had been led, said it was a question for the Government to consider whether the railway platforms of this country should not be of one uniform height, and the step of one pattern, or whether twenty or thirty people should be sacrificed annually. Platform accidents were of frequent occurrence. The railway companies set the example. The manner in which the guards jumped into the breaks on the Metropolitan Railway made him tremble. It was a most reprehensible practice, as it induced young men and others to follow the example set them on this railway. He thought, there should be one universal law for the height of platforms, and that they should be under the carriages. A short time ago he was present at the opening of a line in Jersey. The platforms were uniform, and the steps of the carriages projected over the platforms, rendering an accident almost impossible. A short clause in an Act of Parliament would manage this. True it would cost the railway companies 100,000*l.*, but it would be the means of saving hundreds of valuable lives. The inquiry was adjourned for additional evidence. This question of the platforms we brought under notice not long ago. With reference to the Metropolitan, the coroner's reflections, we think, must have occurred to many. Let us add, that since the Metropolitan District was opened, the line seems to have received an access of bumping engines, rickety carriages, or careless engine-drivers, that are quite a novelty on the Metropolitan. Let some one in authority take a day's holiday and spend it in running to and fro on the line, and he will be certain to discover them if he desire to look into the matter.

CHURCH-BUILDING NEWS.

Bangor.—A new district church, dedicated to St. Elizabeth, and situate at Glasynfryn, a hamlet of the parish of Bangor, Carnarvonshire, and some three or four miles distant from that town,—bordering in fact upon the Snowdonian line of mountains,—has been opened for divine service. The site of the church, as well as of a school which adjoins it, was given by Lord Penrhyn, who also contributed 200*l.* to the erection fund. The total cost of the church and school was about 800*l.* The church is in the Early English style, and was designed by Mr. Gilbert Scott, architect, who presented the plans.

Notgrove.—The chancel of the little church, near Northleach, is being restored by Mr. J. Edward K. Cutts, of London, architect. It is a structure of the latter part of the fourteenth century, lighted by two square-headed windows on the south side. There is no east window—an arrangement common to several churches in the neighbourhood; but outside, in the east wall, about 4 ft. 9 in. from the ground, a crucifix under a canopied arch, with pinnacles on each side, is carved in low relief. Under the chancel arch were two low walls which formed part of the very small old Norman arch, the upper part of which had been taken out, probably at the time the present chancel was built, to insert a larger (but still small) arch, which was put in quite out of the centre of the nave and chancel. The whole wall was in such a ruinous condition, however, that it was found necessary to take it down, and in the rebuilding a larger arch has been inserted. The sanctus bell-cot has been replaced on the new gable. There are monumental effigies of the Whittington family on the south side, and a female figure in the sacrarium on the north side. The chief point of interest is the discovery of nearly the whole scheme of the original sculptured and coloured decoration of the chancel. Some other minor discoveries were a square opening under the westernmost window in the south wall, which had evidently been fitted with a shutter: two coins, one of William Rufus, were pulled out with the piscina; another, of Edward I., was found in the soil at the foundation of the south wall; and some wood (?) charcoal was found in a rough cavity of the well into which the piscina discharged. The restoration comprises the re-building of the south wall, with a new roof, seats, and desk in stained deal; new communion-table, railing, and lectern, in oak; new tile paving, and stained glass by Messrs. Clayton & Bell.

Dorking.—The plans for the erection of a new church, in place of St. Martin's present building, have been on view in the upper room of the local Institute. The architect is Mr. Woodyer. The building will be in unison with the existing chancel.

Southhill.—The ancient church at Southhill, Cornwall, has been re-opened. The church is one of the oldest in Cornwall. While a part of the foundation was being removed during the restoration, a quantity of Norman work was found. A Norman building at one time occupied the site of the present church, which, according to the *Cornish Telegraph*, was erected in the fourteenth century. The tower has not been

touched by the restorers, but the other parts of the church have more or less undergone alteration. The seats, which are open, will hold about 400 persons. The cost will amount to 1,200*l.*, a considerable portion of which has to be subscribed.

Worcestershire.—At Welland, the parish church (a dilapidated building, erected in the last century) is to be abandoned, the population having much increased, and the crowded state of the churchyard imperatively demanding that additional accommodation shall be provided. A site in a more central part of the parish has been given by Mr. A. Watkins, and plans for a new church have been prepared by Mr. Hugall, of Oxford, at an estimated cost of 2,000*l.*; the church to hold 400 persons. It is also said that a new church for part of the parish of Hanley Castle is likely to be founded; that Sir E. Lechmere has given a site on the side of the road leading from Hanley Swan to Malvern Wells; that Mr. Gilbert Scott is the architect; and that Mr. S. Martin, of Hanley Castle, has promised to defray the cost of the building.

Bristol.—The new chancel of the church of the Holy Nativity, Knowle, has been opened. It is of the Byzantine school of architecture, and is the only one of the kind in Bristol. The apse is semicircular with a domed roof, 30ft. in diameter, of cement concrete. At present this dome is coloured blue, but eventually it will be painted, the subject being the Ascension. The altar is of inlaid wood, and over it is a canopy of alabaster and marble, surmounted with carved figures, the whole supported by pillars of marble and alabaster, the capitals of which will be carved. The panels round the chancel are to be filled in with paintings, and "the stations of the cross" will be carved in bas-reliefs around the church. The floors are laid with encaustic tiles. The cost has been about 2,600*l.* It is hoped soon to remove the present temporary wooden nave, and complete the building. A lady of Clifton has promised a tower and peal of bells at her own expense when the remainder of the work is completed.

Eastbourne.—The alterations in the chancel of St. Saviour's Church are now completed. It appears that the area of the chancel did not afford requisite accommodation for the choir and officiating clergyman. This difficulty has now been overcome by making the choir extend westward of the chancel arch into the nave. The space thus appropriated has been raised to the level of the existing chancel, and paved with similar tiles, and a low wall or screen has been erected to form the boundary towards the nave. The base of this wall or screen is of black Isle of Man granite, surmounted by veined Derbyshire alabaster, and having one horizontal band of Devonshire marble. The cornice has a moulding with broad carved leaves at intervals. The work has cost something over 150*l.* The tower of the church is making progress, and has already attained a considerable altitude.

Folkstone.—The old Parish Church is to be fitted with new low, open seats, in place of the present ones, which, though comparatively new, are too high and badly arranged; and the lighting of the nave and transepts is to be completely rearranged. The plans have been prepared by Mr. S. Slingsby Stallwood, architect.

Harrogate.—The chancel and temporary nave of the church for the newly-formed parish of St. Peter's, Harrogate, has been opened for divine worship. For a considerable period the requirements of the newly-formed parish have been met by such accommodation as could be provided in the schools immediately contiguous to the new church; and as this became inadequate for the increasing numbers who attended for public worship the building committee resolved on the somewhat novel expedient of pressing forward with the utmost despatch the completion of the chancel and the easternmost part of the new church; to which by adding a temporary erection, occupying the greater part of the space constituting the centre aisle of the permanent church, they have secured for immediate requirements a place for public worship. St. Peter's Church is situated near Prospect Hotel. The site of the church, together with the contiguous parsonage, and land for the schools, was given by the late Mrs. Feilde, who also contributed 3,000*l.* towards a fund for the endowment. In the erection of the schools, and upon the church, to the present time, a sum of nearly 5,000*l.* has been expended, contributed by residents and those immediately identified with the district. The church has been erected from plans by Mr. J. H. Hirst, architect, Bristol; the builder being Mr. Ridal, of Wadsley, near Sheffield. The building is in the Early Decorated style, and will hold, when completed, 1,100 persons. The chancel, temporary nave, &c., now available, will seat 450. The temporary nave has been so constructed that there will be no interruption during the completion of the edifice. The architect has presented the marble screen; the Misses Carter 400*l.* for an organ; the contractor (Mr. Ridal) the carving of the capitals in the chancel arch and the angels supporting the same; and the whole of the serpentine columns of the chancel were presented, one by each member of the building committee, at a cost of 8 guineas per column. The interior walls of the chancel and apse are of white Bath-stone ashlar, raised from the quarries at Corsham Down. The whole of the carving is in the same material. The carved work of the chancel arch and the upper cornice and the arch-moulds of the windows are enriched by the dog-tooth ornament, similar to the early types found in the cathedrals of York and Ripon. The capitals and corbels are carved, the treatment being of a conventional nature, in accordance with the general architectural features of the church. A cornice runs round the apse immediately beneath the windows. This is now in the artist's hands. Each of the capitals in the angles will be carved as representing foliage of a Scriptural nature,—the vine, wheat, passion-flower, lily, pomegranate, myrtle, with angels chiselled under each, some with musical instruments, and some in the attitude of adoration. The clustered capitals have yet to be carved, and the high blocks beneath the chancel arch, and immediately over the pulpit and reading-desk, have to be hewn into shape. These are to represent groups of angels. The execution of the sculpture and of the carving is in the hands of Mr. Harry Hems, of Exeter.

March.—The foundation-stone of a new church of St. John, the first of four to be erected under the Doddington Rectory Division Act, in this town, has been laid by the bishop of the diocese. Mr. Wyatt is the architect.

Adderbury.—The parish church is undergoing some interior alterations and improvements. The first thing provided for is to warm the church by means of hot-water pipes throughout the building, and Mr. J. P. Barford, of this town, has undertaken the contract for this part of the work. Another portion of the work has been undertaken by Messrs. J. & T. Davis, of Banbury, builders. Messrs. Davis's contract includes the removal of the gallery at the west end, and which has for a long time disfigured the church and blocked up an arch, and they have also to open this arch, so as to have the principal entrance from the western tower, as it should be. This tower is to have a new oak floor overhead, a new stone floor underneath, and a window over the door. The taking down of the gallery has necessitated the removal of the organ down into the chancel, where it is temporarily placed, the instrument being found to be unsuited for its proper position on the chancel-screen, according to the plans of Mr. Scott, the architect, who advised its being placed there.

DISSENTING CHURCH BUILDING NEWS.

Brighton.—The new Congregational Church, erected at the junction of Clifton-road and Dyke-road, has been formally opened for public worship. The new church is of a Romanesque type, modified in places as circumstances dictated. The form of the edifice—that of a horse-shoe, was determined by the shape of the ground. The general design of the church originated with a gentleman of the committee; and to its conspicuous feature, the tower, which is 20 ft. square and 130 ft. high, the public are indebted for a convenience in the shape of a clock which has been erected in the tower, at the cost of gentlemen in the neighbourhood, by Mr. H. Pratt. The cost of the building will, it is estimated, be between 8,000*l.* and 9,000*l.*, and it will seat a congregation of 850, besides providing a vestry and committee-rooms, with school-room (under the church), for 450 children, class-rooms, &c. There are two entrances to the church in the tower: one from the Dyke-road and the other from the Clifton-road. Attention has been paid to the ventilation of the building and to its warming, in winter, by hot-water pipes, this work being done by Messrs. Reed & Co., of Brighton. The building is lighted, in the day-time, by seventeen triple windows in the upper story, and ten large double windows in the front story, and at night by a gas sun-light in the centre of the ceiling. The pewing, of the open kind, with sloped seats, has been executed by Mr. S. Ireland; and an organ is now being put up by Mr. Pickett, of Lewes. The drawings for the plans and details generally were prepared by Mr. T. Simpson, of Brighton, architect to the Committee.

Melton Mowbray.—The new Wesleyan chapel at this place has been opened for public worship. The building is of brickwork, with Bath stone dressings. The architect has, however, relied chiefly upon an arrangement of moulded brickwork for effect, rather than upon the stonework, so that it may be regarded as essentially a brick building. The style chosen is Early Decorated, freely treated. The front is flanked on each side by two towers, the upper portions of which are lighted by three-light windows, above which is a brick cornice and high-pitched roof, each surmounted with an iron terminal. These towers inclose the staircases to galleries, and also to schoolroom below. The centre doorway leads into a lobby, from which the body of the chapel and gallery staircase may be entered. Above the doorway is a large wheel-window in a recess, which occupies nearly all the gable end. The ground floor of the chapel is divided into centre aisles and side aisles, or passages, and convenience of access to all the sittings has been especially studied. At the eastern end of the chapel are transepts extending some distance back, which provide for a good number of sittings in a good situation. The gallery plan is large, extending over the lobbies below. At the east end is a recess, in which the organ is placed and choir accommodated, in front of which is the pulpit, which is approached by a staircase leading direct from the minister's vestry. There is a general vestry beneath the organ-chamber, and a lobby beyond, with staircase for choir. On the basement is a schoolroom, 11 ft. high, the whole size of the chapel; attached to which are two class-rooms and a kitchen. The schoolroom has a boarded floor and wainscoting 3 ft. high all round. The fitting of the chapel are of picked red deal, stained and varnished. The roof is an open one, the principals being supported on stone corbels, carved. The roofs are covered with Bangor slates, and have open perforated red ridge tiles. The chapel is built to accommodate 600, and has cost over 2,000*l.* The contractors were Messrs. Winkles & Kellett, of Leicester. The plumbing work has been executed by Mr. Widdowson, of Leicester; Mr. Pegy, of the same place, supplying the ironwork. The front fence, which has been specially designed, has been supplied by Mr. Sharman, of Melton. The organ, which has been refixed in a new case, designed to accord with the building, has been put in order by Mr. Valentine, of Melton, organ builder. The whole of the works have been carried out from the designs and under the superintendence of Mr. R. W. Johnson, of Melton Mowbray, architect.

Oswestry.—The memorial stone of the new Congregational church, on the site of the old borough gaol, has been laid. The building is already in an advanced state. The plan of the chapel consists of nave, transepts, and side-aisles, the extreme dimensions being 57 ft. by 72 ft. The tower, a conspicuous feature of the design, terminates the south-west aisle, and forms an entrance. It is surmounted by a spire, rising to a height of 103 ft. above the level of Arthur-street. The platform on which the pulpit is put is partly recessed by the formation of an apse. A gallery is placed over the main entrance, and extends to the commencement of the aisles: the approach to this is by a staircase in the tower. Staircases built out at the back of the chapel lead to the class-rooms, vestry, heating-chamber, &c., which are under the main building. The front elevation on the ground level is divided into five bays by an arcade supported by engaged shafts, with foliated caps, the main entrance-doors occupying two of these bays, the remaining three having circular cusped openings disposed in them, which light the interior of the lobby and chapel. Over this arcade is placed a five-light window, the head of which is filled with geometric tracery. The style adopted may be called Early Decorated. Accommodation is provided for 800 persons when the building is completed, and the class-rooms for about 220 children. The building will be pitched faced with Cefn stone, from Messrs. Dennis & Co.'s quarries; the mullions, tracery, and facings will also be supplied by that firm. The benches and other interior fittings will be of deal, stained and var-

nished. The contract for the work has been taken by Messrs. Morris & Chaplin, for the sum of 3,500*l.*, exclusive of lighting and heating, and will be executed from the designs and under the superintendence of Mr. W. H. Spaull, architect, Oswestry.

Belper.—The memorial-stone of the new Congregational Church at Belper has been laid. The church, which is now in course of erection, is from the designs of Mr. George Woodhouse, architect, Bolton; the contractors being Messrs. Walker & Sons, builders, Worksworth, and Mr. Charles Cash, joiner, Duffield. The style is Decorated. The edifice will seat 550, and galleries may be added to afford accommodation for 200 more, if desired. The entire cost (including the expense of adapting a portion of the chapel taken down last year for Sunday-school purposes, &c.) is estimated at about 4,100*l.*, a considerable portion of which has already been contributed.

Derby.—Bourne Memorial Chapel, Kedleston-street, Derby, has been opened for divine service. The plan of the edifice is nearly square, the internal dimensions being 60 ft. by 55 ft. and 33 ft. in height. The sittings on the ground floor are arranged in a circular form round the rostrum and communion enclosure, with a sloping floor. The gallery is also circular on plan, with ornamental iron scroll-work to the front. Accommodation is provided for about 1,000 adults. The rostrum is approached by stairs on each side, with ornamental balusters, and mahogany moulded rail, continued round both rostrum and communion below. Two entrances are formed at the front, with space for a vestry between them. There are also two side entrances. The woodwork inside is stained and varnished. The windows have ground glass, with light amber-coloured margins, while the walls are light grey, and the ironwork is to be white, relieved with gilding. The ceiling is panelled, with beams, and moulded. The Derwent Foundry Company supplied the warming apparatus. The chapel is lighted at night by chandeliers, and several ornamental brackets, supplied by Mrs. Woolhouse. The exterior is built in Denby white bricks, relieved with red bricks, in patterns, to the arches and bands, and encaustic-tile panels. Stone dressings are introduced, with moulded and carved imposts, cornices, and columns. The roof is of single span, with ornamental gable in the front, forming a pediment, flanked by two towers, containing the staircases to galleries, and finished with spires covered with slates in coloured bands and iron terminals. The front has iron palisading and gates to match, on stone base; and broad flight of stone steps to the entrance. The cost of the work is about 3,000*l.* The works have been executed by Mr. E. Dusantoy, from designs and under the superintendence of Messrs. Giles & Brookhouse, of this town, architects. The style of architecture is Lombardic.

Mirfield.—The corner stone of a new Baptist Chapel has been laid on the site of the old one, at Knowle, Mirfield. The new building will be in the Romanesque style of architecture, liberally treated. It will seat 630 persons, and the estimated cost is 3,000*l.*

Great Totham. — The new Congregational Chapel at Totham has been completed and opened for divine service. The new building, which adjoins the old chapel, and stands at right angles with it, in a portion of the burial-ground, is designed to accommodate 320 persons, —viz., 230 on the ground-floor and 90 in a gallery at the end. The walls are of red brick of the neighbourhood, relieved with white arches, bands, and patterns. Stained deal benches are provided throughout the edifice. The estimated cost of the works, when begun, was 600*l.*, and the architect has completed the structure for 650*l.* Mr. King, jun., of Halstead, was the contractor, and has carried out the works under the direction of Mr. Charles Pertwee, of Chelmsford, architect. The painting, decorating, &c., of the new building have been done by Mr. Wilder, of Halstead. The following shows the details of the cost: — Builder's contract for chapel, 505*l.*; cost of new front to school-room, 83*l.*; extra outlay in the chapel, furnishing both the chapel and school, and providing new harmonium, 90*l.*; making a total expenditure of 678*l.*

Ovenden.—The chief stone of a new General Baptist Chapel for Ovenden has been laid. The site on which the building is being erected is on an elevated piece of ground situated at the top of Lee Bank. The dimensions of the building will be 77 ft. by 45 ft., and the design is Gothic, with pitchfaced gabled front and two slightly-projecting porticos, by Mr. T. Horsfield, Halifax, architect. Over the porticos will be large central rose windows, and smaller ones on each side, with ashlar quoins and labial moulds and strings. The side elevation has six two-light windows and buttresses. Internally, class-rooms will be at each end, over which will be the lecture-room and galleries. A cottage will be provided in the basement for the chapel-keeper, and the total cost is estimated at 1,500*l.*, towards which about 400*l.* have been already subscribed or promised.

SCHOOL-BUILDING NEWS.

Lower Slaughter (*Gloucestershire*).—An infant school and class-room with boys' and girls' porches, have just been completed at Lower Slaughter. The dimensions of the school are 25 ft. by 16 ft., with class-room, 12 ft. by 10 ft. The walls are built of the Weal rough warm-coloured stone, with dressings of the Farmington freestone. A somewhat unusual and picturesque feature in school buildings has been introduced (by Mr. Whitmore's suggestion), in the shape of a bay window to the gable end next the high-road, the object being both to emphasise this part and to give additional space inside the room. The windows have stone mullions and transoms, and there are stone copings to the gables. The roofs are substantially constructed with open timbers, boarded at the back of the rafters, and varnished (without any staining). A bell-turret, with spirelet, covered with oak shingle, rises from the main roof (the latter covered with stone slates). The whole expense of the work (upwards of 500*l.*) has been defrayed by Mr. Charles S. Whitmore, Q.C., the recorder of Gloucester. The same gentleman also rebuilt, at his own cost, some five years since, the parish church of Lower Slaughter, from the designs of Mr. Ferrey, F.S.A. The architect to the school buildings recently completed was Mr. Edmund B. Ferrey. It may be remarked, that the village is of remarkably picturesque architecture, nearly all the cottages, &c., being in character, with gables having stone copings, mullioned and transomed windows, with labels over. Mr. Albert Estcourt, of Gloucester, was the contractor for the works.

Minard.—The new school erected at Achagoil by Mr. John Pender, of Minard Castle, for the benefit of those resident on his estate and others, has been opened under auspicious circumstances, says the *Northern Echo*. The building, which includes a house for the master, is of the domestic Gothic style of architecture, built of black whinstone, quarried on the estate, and was designed and erected by Mr. William M'Kenzie, the carpenter on the property. The school-room is 35 ft. by 18 ft., and 15 ft. high; class-room, 14 ft. by 12 ft., and 12 ft. high; entrance lobby, 12 ft. by 10 ft.; and the dwelling-house contains five rooms. The ceiling is Gothic, diagonally lined with varnished pine, having four ornamental couples resting on ornamental corbels. The spandrels are relieved with a decoration of fret-work. The walls are lined round with pine to the height of 4 ft., and the plaster work is painted. The situation is on a knoll overlooking the road which runs along the shore of Lochfyne, between Lochgilphead and Inverary.

Castle Fields, Shrewsbury.—The chief corner stone of the proposed schools for the district of All Saints was laid on Tuesday, the 19th inst. The building will consist of boys', girls', and infants' schools; the total provision, with the class-rooms, being for 260 children. The walls will be built of red brick, relieved with bands, &c., of white and blue brick. Mr. E. Haycock is the architect, and the contract has been taken by Messrs. Bowdler & Darlington for 852*l.*

STAINED GLASS.

Winkleigh Church, North Devon.—The south window of the chancel has just been filled with painted glass by Mr. W. C. L. Floyd, to the memory of his wife and infant son. The east light represents a female figure of Faith, bearing a cross. There is a palm-tree in the back-ground, and above is an angel holding a scroll. The west light contains a figure of Hope and her anchor, and above is an angel with scroll. The ornamental filling of each light consists chiefly of passion flowers. The small top light contains a Cherub. The artists were Messrs. Ward & Hughes, of London.

St. Martin's, Scarborough.—Four new windows have been placed in the chancel of this church. They are by Messrs. Morris & Co., of London. The subject is the four living beings described in the fourth chapter of the Revelation, and the seventh verse. It is well known that these have been in old days taken as symbols of the four Evangelists, or rather of their Gospels. In the new windows the idea of these symbols is preserved, and each evangelist's name is placed on a scroll in the window. These windows are the gift of Miss Mary Craven, and are intended by her to be associated with the names of some who have worked in connexion with St. Martin's. Two will be thank-offerings for the recovery from severe illness of Mr. Bodley, the architect of St. Martin's, and Mr. Parr, its first vicar; the other two are Miss Craven's tribute of respect for the labours of Mr. Lister, the present curate and preceptor, and Dr. Sloman, its organist.

Redenhall Church.—A stained-glass window has been recently placed in the south aisle of this church, to the memory of the late Mrs. Ormerod, wife of the rector, the Ven. Archdeacon Ormerod, at the cost of her six children. The window has three lights, representing the Resurrection of our Lord. The central light contains a figure of the Saviour, while beneath it is the sitting figure of the angel who watched by the tomb. In the eastern side-light are given the three women who went early to the sepulchre on the Resurrection morning, and in the third light appear St. Peter and St. John. Both the side-lights have in the upper compartment an angel bearing a scroll, and in the lower an angel adoring. The foot of the central light has the *Agnus Dei*. The top of the window is filled up with the family arms. Messrs. Heaton, Butler, & Bayne, of London, were the artists.

St. James's, Brighouse.—The east window of this church has been recently filled with painted glass by Mr. Frederick Craven, of Kersal, Manchester, in memory of a son. It is of three lights, with tracery above. The central light contains one subject only; the outer ones are divided each into three compartments. The central subject is the Crucifixion of our Lord. In the central compartment of the first light, that is, to the right of the Saviour, are the three Maries. In the corresponding compartment of the third light, that is, to the left of the Saviour, are John, the beloved disciple, with, on his right, Joseph of Arimathea, and on his left Nicodemus. Above each of these compartments, separated from them by fringes of cloud, are six angels, three on each side. In the lowest compartment of the first light is Christ blessing little children. The Calling of Samuel occupies the corresponding compartment of the third light. The treatment of the Crucifixion is not historical, as is usual, but mystical. The angel in the tracery over the three Maries was designed by Dante Gabriel Rosetti; the Calling of Samuel, by Madox Browne; and the rest of the window by E. Burne Jones; the general execution of the whole being by Messrs. Morris & Co., of Bloomsbury.

Dunbar Church.—The introduction of stained glass into the parish church of Dunbar, in Scotland, was commenced in 1865 by the erection of the memorial window upon the one side of the pulpit, presented by Captain Hay, of Belton; and the window upon the opposite side of the pulpit has just been filled in a similar manner, by Mr. A. Drysdale, of Castellan House. There are six large compartments in the Drysdale window, each containing a Scriptural subject. In the three upper compartments are illustrations of "Suffer little children to come unto Me," "The Sermon on the Mount," and "Christ washing His disciples' feet;" and in the under compartments, "Christ bearing His Cross," "His Entombment," and "His appearance to Mary in the garden." The artists were Messrs. James Ballantine & Son, of Edinburgh.

FROM AUSTRALIA.

Melbourne.—The block of ground at the corner of William and Latrobe streets, then occupied by the old Exhibition building, having been selected as the site for the Victoria Mint, instructions were issued by the Government to have plans and specifications prepared forthwith, by Mr. S. H. Merrett, of the Public Works Department. In due course the design was approved, and the tender of Messrs. Murray & Beauchamp, to erect the operating departments of the Mint for a sum of 22,000*l.*, was accepted. This done, the work was at once commenced, and the buildings soon began to assume a state of

forwardness which enabled some idea of their magnitude to be formed. The area of ground which will be occupied by the buildings is the entire block bounded by William-street, Latrobe-street, and Lonsdale-street, or, in other words, a frontage of 313 ft. to William-street, by the same depth towards Queen-street. The frontage towards the main street will be occupied by the administrative offices, while in the rear the operating departments will form three sides of a quadrangle, the entire block of buildings occupying an exact square. The present contract in course of progress only includes the operative branch, the tenders for the erection of the main buildings not yet having been called for; nor indeed has the design for this part of the structure been finally determined upon.

Richmond. — The town of Richmond has now a town-hall and municipal buildings, quite in unison with the steady and permanent advancement of this important suburb. The pile of building, having a frontage of about 180 ft. to the Bridge-road, is thus appropriated:—The central portion contains the municipal offices—mayor's room, town clerk's room, committee room, treasurer's room, &c., with a public library on the second floor, about 50 ft. by 23 ft. In the centre rises the tower to an altitude of 130 ft., and containing provision for clock and bells, the lower portion of the tower being used for muniment-rooms. The west wing comprises the police-court, magistrates' rooms, &c.; and the east the post-office, telegraph office, and savings bank. At the rear, partially concealed by the buildings in front, is the townhall, measuring 75 ft. in length by 45 ft. in width, the height being 33 ft. Attached to this room are retiring, refreshment, and ante rooms. The design for this building was selected from many others, and, we are informed, would be completed within the amount originally contemplated to be expended. The architect was Mr. Charles Wickers, of Melbourne; Mr. S. L. Carrell the contractor; and Mr. Ryton Oldham the clerk of works.

Books Received.

The Proposed England and India Railway: a Letter to the Right Hon. W. Gladstone, M.P. By WILLIAM LOW & GEORGE THOMAS, Civil Engineers, Cardiff. London: Savill, Edwards, & Co., printers, Covent Garden. 1871."

"To India in five days:" that is the purport of this pamphlet;—but say seven days. And after the wonders (in a rougher and cheaper way certainly) already accomplished in America, from east to west, as well as from north to south, impossible is not a word to be for a moment entertained. The whole journey just now takes, nominally, twenty days, but often actually a good deal more. The proposal of Messrs. Low and Thomas is to make use of existing lines of railway and of the Mont Cenis Tunnel, to Trieste, and thence to construct a railroad through Austria, European and Asiatic Turkey, Persia, and Beloochistan, to Kurrachee, and onwards to Bombay. On leaving Trieste, the projected line would pass by Fiume to the eastern shore of the Adriatic, and run southwards along this shore to a point nearly opposite Brindisi. Thence it would turn directly eastward, across Turkey, and to the north of the Archipelago, and the sea of Marmora, to Constantinople. Crossing the Bosphorus, it would turn southward at Scutari, and reach the Mediterranean at Adalia. From Adalia to Alexandretta it would skirt the coast, and from Alexandretta would pursue a south-easterly course to the western extremity of the Persian Gulf. From this point it would follow the shore of the Gulf and of the Arabian Sea to Kurrachee. The authors include in the plan a branch from near Antioch to Jerusalem, and a branch to join the Smyrna and Aidin Railway. Without considering these branches, the total distance from London to Kurrachee would be 5,311 miles by rail, and 28 miles (the Straits of Dover) by sea. At a uniform rate of 10½ miles an hour by water and 40 miles an hour by land, the journey from end to end would be accomplished in 5 days, 16 hours, 46 minutes. Calculating the railway travelling at 30 miles an hour the time would be 7 days, 13 hours, 22 minutes; and at 50 miles an hour, 4 days, 10 hours, and 13 minutes. Of the total length of line required nearly one-fourth (1,170 miles) is already constructed. The highest estimated cost of the whole undertaking is, in round numbers, 41 millions sterling, and the estimated cost per mile ranges from 8,000*l.* to 17,000*l.* in different localities. Under a second proposal, the total cost would only be 24,279,000*l.* The authors suggest that the cost of construction should be borne, not by one nation only, but by all through which the line would pass.

VARIORUM.

"THE Annual Report of the Medical Officer of Health for the parish of St. George the Martyr, Southwark." This report by Dr. Bateson sums up, to a certain extent, the results of the duties and responsibilities which vestrymen undertook in 1856, after the passing of the Metropolis Management Act.——"Open Spaces Within and Around the Metropolis. By M. Corner, M.D. Coningham, Limehouse." Dr. Corner is a medical officer of health, and his brief remarks here relate to the necessity for the creation and preservation of open spaces,—a subject with which we completely agree, and on which we have often dilated.——"Rules for the Promotion of Health. By William Whitelaw, M.D., Kirkintilloch." In a condensed form, and on the face of a sheet of paper, Dr. Whitelaw here gives many useful hints as to cleanliness, of premises and person, food, light, exercise, precautionary measures, &c. They deserve to be widely distributed.——In a kindred spirit, with more especial reference to cholera and diarrhœa, a little tractate by M. A. B., on "Some Simple Sanitary Precautions against Cholera and Diarrhœa," has been published by Lewis, 136, Gower-street. It contains useful suggestions concerning dietetic treatment, especially with regard to infants. As this is a fitting season, the autumn, when diarrhœa is apt to prevail, and as medical men advise immediate attention to its symptoms, especially when there is any fear of virulent cholera, we may here repeat a hint we have heretofore given, that a penny-worth of camphor dissolved in a penny-worth of clove oil, and a few drops taken at a time for a dose, will often remove diarrhœal symptoms. Where these still resist the drops, a penny-worth of laudanum added to the mixture, and shaken up with it when dropped out for use, will strengthen the effect.——"Papers on the Cause of Rain, Storms, Aurora, and Terrestrial Magnetism. By G. A. Rowell. Williams & Norgate, Covent Garden." This is a reprint from the *Edinburgh New Philosophical Journal*, &c., of papers intended as an appeal on behalf of a thoughtful theory advanced by the author, who is an honorary member of the Ashmolean Society, and assistant in the Oxford Museums. Mr. Rowell's opinion, based upon certain facts, is that electricity is the principal agent in evaporation, and that the fall or not of ordinary rains depends chiefly on the damp or dry state of the air, *i.e.*, its conducting or non-conducting condition for the electricity of the clouds. This theory as to evaporation, &c., would account for the curious phenomenon of lakes, ponds, and moist earth smoking on certain cold mornings, when assuredly heat does not do it.——"Palestine Exploration Fund: Quarterly Statement: New Series: No. 3, August, 1871. Office of the Society, 9, Pall-mall East." The number contains a variety of interesting matter, on the Discovery of a Tablet from King Herod's Temple, by M. Clermont Ganneau; on a Greek Inscription from Smyrna; on the Moabite stone, by Herr H. Peterman; on Gold in Syria; on the Haram es Sheriff; and others. The next expedition leaves this autumn, and an appeal to enable the Society to carry out the interesting enterprise is made in the preface.——The October part of *Cassell's Magazine* contains the commencement of a new story, by Mr. Wilkie Collins, called "Poor Miss Finch," which promises to be very interesting. Curiosity is already aroused, and we wait impatiently for the next number.——What have we here? "Magl i Ddala Haul-Belydryn. Gan Awdures yr Hen Jolliffe,' &c." Is it Hungarian? That can scarcely be, for it is published by Philip Williams, of Aberystwyth. No, it is nothing less than the well-known charming little story, "A Trap to Catch a Sunbeam" (written by Mrs. Henry Mackarness in the earlier part of her life), translated into Welsh, and issued for the benefit of the rising generation of the Principality, though it is quite time that they were all made able to read it in English. The progressive popularity of this story is very remarkable; at least forty editions of it have been published, and it has been translated into many languages, including, we believe, some of the Indian dialects. It is so good of its kind, that we rejoice in its success.——"Woman's Work; with special reference to Industrial Employment. By Emily Faithfull. London: Victoria Press, Princes-street, Hanover-square, W." This able paper was read at the meeting of the Society of Arts on March 29th, 1871. Miss Faithfull, as she states, does "not for one moment seek to remove women from those household duties which seem so naturally to come within their special sphere." As it is a subject, however, to which she has given some years' reflection, she thought the result might elicit a discussion which would tend to throw some new light upon a very difficult and perplexing problem.

Miscellanea.

The East London Tabernacle. — The largest building for religious purposes in the East of London has been opened for the use of the Baptist congregation, under the pastorate of the Rev. A. G. Brown. The new East London Tabernacle, which will provide sitting accommodation for about 3,000 persons, has been erected in Burdett-road, Bow, at a cost of about 12,000*l.* The frontage is nearly 114 ft. in length; the height 60 ft., with a turret at either end; and the depth 83 ft. The basement contains a school or lecture-hall, 92 ft. by 64 ft., with class-rooms, and ample lavatorial accommodation, with hot-water apparatus. With the exception of the platform, which is 20 ft. square, and which is situated immediately over the baptistery, the ground-floor is entirely occupied by sittings. The gallery, which has a minimum width of 16 ft., is approached by four stone staircases, and the floors and gallery are sustained by iron columns. The span of the roof which is of the ordinary fir-framed construction, is upwards of 64 ft. in the clear. Externally, the frontage towards the Burdett-road has a double range of windows, lighting the school-room and the main building; and at about 10 ft. from the base there is a string course, from which rises a colonnade of ten Corinthian pilasters in Bath stone, of which material the dressings and cornices are also constructed.

Farringdon Market. — A meeting of the salesmen in Farringdon Market has been held to consider some proposed alterations in connexion with the market. It had been called by the Trade Association. Mr. Phillips proposed a resolution in favour of a change of site by which a suggestion of the *Times*, that "if a railway could not be brought to a market, the market ought to be taken to the railway," might be carried out. He said the failure of the present market was entirely due to its bad position. The proposed new site in Farringdon-road was a capital one, and it would have the advantage of securing to the salesmen for the carriage of their goods direct railway communication with all parts of the kingdom. The market would do honour to the corporation if they could be induced to construct it, and would meet with the approval of the public. It would, on the other hand, be merely wasting public money to reconstruct the present market. The meeting passed a resolution authorising the association to confer with a committee in the ward.

Another New Bank for Middlesbrough. Scarcely have the National and Provincial Banking Company commenced building operations, than we learn that Messrs. J. Backhouse & Co. have decided upon erecting new banking premises on a corner site facing the railway and Exchange. Like most of the old-established branches of this firm, the one at Middlesbrough has become inconveniently small for the transaction of business. The architect for the new erection, Mr. G. G. Hoskins, of Darlington, has lately erected structures for the same firm at Sunderland and Bishop Auckland.

Vandalism at Stonehenge. — The proprietor of Stonehenge writes to say that the remains are much less damaged than recent statements had led people to think; and, considering the number of persons who visit them, he regards the fact as very creditable to the public. When mischief was done, it was not usually by the operative class.

Technical Education. — As our advertising columns have shown, the classes of the Birkbeck Institution are announced to commence on October 2nd. Instruction will be provided in all branches of science and art, in addition to the large number of other subjects set forth in the announcement.

The New Law for Threats and Molestations.—The Act passed in the recent session relating to violence, threats, and molestations under which persons on strike at Newcastle have been imprisoned, should be generally known. Any person is now liable to an imprisonment, with or without hard labour, for a period not exceeding three months, who uses violence to any person or property, who threatens or intimidates any persons in such a manner as would justify a justice of the peace on complaint made to him, to bind him over to keep the peace; who molests or obstructs any person, as defined by the Act with a view to coerce him—that is, being master, to dismiss or to cease to employ any workman; or, being a workman, to quit any employment or to return work before it is finished; being a master not to offer, or being a workman not to accept any employment or work; being a master or workman to belong or not to belong to any temporary or permanent association or combination; being a master or workman to pay any fine or penalty imposed by any temporary or permanent association or combination; being a master to alter the mode of carrying on his business, or the number or description of any persons employed by him.

A Runaway Steam Roller.—An exciting occurrence took place the other day in Pall-mall and Cockspur-street, Charing-cross, which might have been attended with loss of life, several persons being injured, and others having a narrow escape from death. A large steam-roller was left standing without any attendance, at the engine-man's dinner-hour, near the statue in front of the Pall-mall Restaurant. A mischievous boy jumped on the engine and started it. The locomotive, to the dismay of the spectators, commenced to move ahead. At first it appeared inclined to demolish the statue referred to, for it darted straight for it, but turned round and went across the street, over the pavement, and into premises in Cockspur-street, breaking down the stonework under the window, the window itself being completely demolished. Mr. Oswald Allen, connected with the Grecian Theatre, fell in front of the engine, but was rescued. He sustained, however, a fracture of the left leg. Several other persons were also injured. As soon as the engine came to a stand, the boy who occasioned all the mischief jumped off and got clear away. The engine was not moved off the pavement till the driver returned from his dinner. It is to be hoped no such carelessness will be shown in London again.

The Vienna International Exhibition in 1873.—The Emperor of Austria has sanctioned the project of holding this Exhibition, and has appointed an Imperial Commission to carry out the project. The Commission, which is composed after the model of the English and French Commissions, consists of the Emperor's brother, Archduke Charles Louis, who has been nominated patron of the Exhibition; Archduke Rainer, president; Count Von Beust, and others, vice-presidents. The Commission also includes the presidents of the chief artistic, commercial, and scientific societies, and other gentlemen distinguished in science, art, and industry. The Commission held its inaugural meeting on Sunday, the 17th inst., and issued its programme. It is in contemplation to combine with the exhibition courses of lectures in connexion with the objects exhibited, and to arrange international congresses of learned men, artists, architects, engineers, and others. The Emperor has granted the use of the Prater for the site of the Exhibition, which is described as the Windsor Park of Vienna by Mr. Scott-Russell, who is at present at Vienna consulting with Baron von Schwarz as to the design for the building. It is intended to be very comprehensive.

North Bridge, Halifax.—The work upon this new bridge is progressing rapidly towards completion; the whole of the iron roadway is laid, and the dross bedding for the setting is nearly completed. It was at one time contemplated to lay the whole roadway in asphalte, but it has since been found that this cannot be done, and it has therefore been decided to asphalte the footway only, and lay the central roadway with ordinary setts. They will not much add to the adornment of the bridge. It was fairly tested when the immense boiler for Messrs. Salt's works, at Saltaire, passed over that portion already completed. This mass of metal weighed, with its conveyance, between 30 and 40 tons. The deflection was very slight.

An alleged Nuisance in Westminster.—Mr. Lot Brass, owner of extensive foundry and smelting works in Eccleston-street East, Pimlico, was summoned by Dr. Aldis, the medical officer of health of St. George's, Hanover-square, in consequence of his workshop not being ventilated in such a manner as to render harmless, as far as practicable, any gas, vapours, dust, or other impurities generated in the course of the work carried on therein, so as to be a nuisance under the Act of 1865. Dr. Aldis gave evidence to the effect that the process of smelting iron was carried on in these premises, and the coke, as well as iron, emitted sulphurous and other noxious vapours of a deadly character. In the smelting of bronze,—the defendant having the contract to do the Wellington statue in St. Paul's,—the vapours were not so bad, but they were still injurious to health. The defendant called the chairman of the Board that voted the issuing of the present summons, and that gentleman denied that he smelt anything bad when the work was going on. The summons was adjourned for twelve weeks, to enable a new shaft to be completed.

The Hotel de Ville.—The Prefect of the Seine recently instituted a committee, presided over by himself, and composed of members of the municipal council, artists, sculptors, architects, archæologists, &c., to decide on the question of rebuilding the Hôtel de Ville. A preliminary report on the subject had already been drawn up by M. Duc, representing the committee of architects of the municipality. The document showed that two proposals were in presence; one to reproduce the building as it existed before the fire, and the other to erect it as previously to the alterations made by Count de Rambuteau. According to the *Morning Post*, MM. Perrin & Charles Blanc criticised the additions made under the Government of July, and brought forward a third proposal, which was to rebuild the small façade of the old Hôtel de Ville, and to erect at the sides and in the rear low buildings for offices, which, having no pretension to match the other, would leave the original work of Bocador to stand alone in its former beauty. A sub-committee, consisting of the two authors of the project, and MM. Vaudoyer, Duc, and Labrouste, was appointed to consider this new plan and report on it.

The Huddersfield New Waterworks.—A visit has been paid by the members of the Huddersfield Town Council and others to the new waterworks, now in course of construction, at Blackmoor Foot and Deerhill. The party, who were joined by the mayor and Mr. Hawksley, C.E., made an inspection of the works, and expressed their satisfaction with the progress made in the preliminary operations. During the afternoon the mayor laid the foundation-stone of the shaft and culvert of the Deerhill Reservoir. Mr. Hawksley stated that the whole of the new and the existing works combined would afford to the town of Huddersfield, in the most droughty seasons, from 4,000,000 to 4,500,000 galls. per diem. It was a fact that it was scarcely anywhere possible to secure 1,000,000 galls. per day, over and above compensation to millowners, at an expense of less than from 120,000*l.* to 150,000*l.*, but in the case of Huddersfield there would, he believed, be no such expense incurred. It might reasonably be expected that within the next few years an income of 18,000*l.* a year would be realised from these works.

Open Spaces.—Two Acts were passed in the recent session (34 & 35 Vict., cap. 181 and cap. 204), for vesting the management of the open spaces known as Wandsworth Common and Wimbledon and Putney Commons in a body of conservators, with a view to the preservation of the same. There are 73 sections in one Act and 110 in the other. As to Wandsworth Common, Earl Spencer is to have a perpetual annuity of 250*l.*, to be levied by the rates, and 1,200*l.* in respect of Wimbledon and Putney Commons. It is recited in the Acts that it would be of great local and public advantage if the commons were always kept uninclosed and unbuilt on, their natural aspect and state being, as far as may be, preserved.

Society of Engineers.—The first meeting of the Society for the new session will be held in the Society's Hall, Westminster Palace Hotel, on Monday, the 2nd of October, 1871, when a paper will be read on "Recent Improvements in Explosive Compounds," by Mr. Perry F. Nursey. The other meetings for this year will be held on November 6th and December 4th, and the annual meeting on December 11th.

Essays by Workmen.—The Working Men's Club and Institute Union have determined to invite the members of their affiliated institutions to record their ideas on sundry important questions which deeply affect the welfare of the people at large. They believe that much good may be effected by inducing intelligent workmen to write papers on subjects which lie within the scope of their own personal experience, and by making other classes acquainted with their opinions and suggestions. Prizes have accordingly been offered for the best essay on the following subject, and others will shortly be announced:—"The causes of the alleged absence of thrift and saving habits among a considerable portion of the industrious classes of this country, as compared with the same classes in other countries, and the remedies for this state of things." The union will be very glad to receive aid and suggestions in carrying out this useful work.

Ecclesiastical Dilapidations.—Mr. Thos. Morris suggests, in the *Times*, that it is desirable to combine with the merely possible contingency of fire the ultimate destruction by time, which is certain. "On an occasion where a seven years' insurance had been effected in a mutual office, and the premium paid down, the whole sum was restored at the end of the term, as the losses and charges of every kind had been met by the usufruct of the money alone. Assuming the duration of a building to be a century, a single pound a year at 3 per cent. compound interest would exceed 600*l.* in the time, and at 4 per cent. it would be over 1,200*l.* A small yearly sum would, therefore, certainly suffice for the twofold object, and might be readily adjusted to all degrees of stability."

New Gas Works.—The foundation-stone of gas-works has been laid at Holt, in Denbighshire, North Wales. Mr. S. Harrison, of Ebenezer Cottage, performed the ceremony, and said he was pleased to have the honour of laying the foundation-stone of the first public works that had as yet been erected in the ancient town. Who among the inhabitants, twelve months ago, he said, would have thought seriously of gas-works for Holt. There was also some talk about waterworks, but what was most wanted to make Holt a prosperous place was a railway. The people of Holt were great producers. Their system of cultivation was greatly improved, and where only potatoes, plums, and cucumbers had been grown years ago, they had now turned their attention to the cultivation of more costly vegetables and fruits, which found ready sale in the Liverpool and Manchester markets.

Carnarvon Castle.—Mr. Llewelyn Turner, deputy constable of Carnarvon Castle, writes to the *Times* stating that after the dismantling of the castle a cottage was erected in the lower end of the moat, which was suffered to remain long enough to bar the rights of the Crown, and that he had endeavoured to purchase the place. The price demanded was 400*l.* (three times the value of the site), and on tendering that he was met by a demand for 450*l.*, which he also offered, but the demand increased 50*l.* a day. The Carnarvon Harbour Trust did all they could to prevent such an act of vandalism; but the Corporation of Carnarvon, he adds, have actually waived the requirements of their by-laws to enable three unhealthy houses to be built in the moat.

Newington Church and the Widening of Newington Butts.—In consequence of the action which is now being taken by the local authorities, it is highly probable that Newington Church will shortly be taken down, in order to admit of the proposed widening of Newington Butts. At their meeting held this week, the Lambeth vestry agreed to present a memorial to the Metropolitan Board of Works requesting them to take steps for the removal of the church. The Newington vestry had already pursued a similar course.

The New Billingsgate Market Act.—Certain improvements are to be effected under an Act recently passed to enlarge the site of Billingsgate Market. The Corporation of London has the power for the compulsory purchase of lands for three years, and Nicholson's Wharf is not to be taken without the consent of the owner.

Rotherhithe Workhouse.—The St. Olave's Board of Guardians have been instructed by the Local Government Board to pay Mr. Hunt the sum of 157*l.* 10*s.* for valuing the Rotherhithe Workhouse.